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THE WILSON BULLETIN

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THE WILSON BULLETIN

A QUARTERLY MAGAZINE OF ORNITHOLOGY

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Vol. L JUNE, 1938 No. 2

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THE AMERICAN COOT IN IOWA

BY CHARLES E. FRILEY, JR., LOGAN J. BENNETT, AND GEORGE O. HENDRICKSON

For major studies in waterfowl, rail, and shore bird problems the natural lake and marsh region of northwest Iowa is proving to be highly valuable. This region lies in the Wisconsin glacial drift area which enters the state at its northern boundary and extends southward to Des Moines, the state capitol. Approximately twenty-one counties of northern and central Iowa, representing about one-fifth of the state's area, are covered by the Wisconsin glacial drift of boulders, sand, silt and clay.

The Wisconsin drift area is bordered on the east by the older and well-drained Iowa glacial drift. To the west is found the well-drained region of deep Missouri loess, wind-blown soil from the far West, and to the south lies the thinner Southern Iowa loess. Underlying these uppermost soils is the Kansas glacial drift material generally known as blue clay, indicating the characteristic color and texture of the unweathered components.

In the nearly level Wisconsin drift area the underlying blue clay of the Kansas glacial till forms the tough and impervious bottom for numerous lake, marsh, and pothole sites, many of which have been drained. With miles of dredged ditches and with many more miles of underground drain tile much of the accumulating surface water is carried quickly away from the Wisconsin drift. Where proper drainage is feasible a stable general agriculture is established because in many cases the original high costs of drainage were met during the first twenty years of this century, a period of increasing demands for cereal and animal food products and consequently higher prices and profits to the farmer.

But even during the period of highest prices some of the lakes, marshes, and potholes could not be drained profitably. Particularly near the edges of the Wisconsin drift characteristic glacial morainic hills make possible a number of deep clear water lakes such as Spirit, Okoboji, Clear, and Storm Lakes that are well known for fishing and

other forms of lake recreation. These recreational values are so high that the deep water lakes are quite safe from man's drainage proclivities. The Iowa State Conservation Commission has jurisdiction over sixty-five of the large natural lakes and most of these are in the Wisconsin glacial region. In addition several hundred lakes and marshes and several thousand potholes under private ownership remain to attract waterfowl and other water life. Most of these bodies of water are valued highly in the recent years of drought, and their wildlife products yield profitable returns.

Now it appears evident that these lakes, marshes, and potholes are to be available for better management of wildlife throughout many years to come. From them some economic returns to the state and to individual owners are possible, and immeasurable recreational values are apparent. Characteristic of our present civilization is the general acceptance of original investigation and research to enhance economic returns and other values in all pursuits and fields of human endeavor. Hence the proper utilization of the water bodies of the lake region of Iowa presents numerous problems around each form of wildlife and in the inter-relations between the many living forms.

Intensive research is underway with several of the more valuable animals of this region, and many casual observations are made with other forms of wildlife. Characteristic of the marshes is the American Coot (*Fulica americana americana* Gmelin). Without devoting long periods of time to observation the authors during several past years have accumulated some data which will be of value in the management of the Coot.

In 1933, the spring migration flight was observed closely by Bennett at Mud Lake, Clay County. The first Coots arrived March 10 and the last ones apparently were in by April 15. In total, it was estimated that 20,000 Coots rested for a time on this one marsh, then of about 350 acres in area. No noticeable decline in numbers of migrating Coots was apparent in this particular region during the past four years.

Next of particular interest was the number of Coots remaining to nest at particular marshes and the nesting capacities of these bodies of water. In late June, 1932, Mud Lake, of about 350 acres in area and with water to a depth of about two feet, showed less than 10 per cent of its surface as open water. The remainder was hidden by vegetation of which the sedge (*Carex riparia*) and the bulrush (*Scirpus fluviatilis*) were dominant species. On June 25 of that year 189 Coots' nests were counted on one-fourth of the marsh; no count nor estimate was made

of the numbers of nests in the remaining three-fourths. In the summer of 1935 approximately 100 pairs of Coots were resident on the same marsh. In that year the depth of the water had increased to three feet and about one-third of its surface was open. The dominant plants of the remaining two-thirds were the bulrushes (*Scirpus occidentalis, S. validus* and *S. fluviatilis*). During the same summer thorough search revealed only eleven Coots' nests on Goose Lake, Hamilton County, of eighty acres in area and with about one-third of its area in open water; the bulrushes (*Scirpus occidentalis, S. validus*), the cattail (*Tyha latifolia*), and the arrowhead (*Sagittaria latifolia*) were dominant emergent plants. The largest number of Coots seen in a single day on Goose Lake was twenty.

The small number of nests on Goose Lake was thought to be due in part to the clogging of parts of the marsh by islands of decaying vegetation according to Hendrickson (1936). Also the old procumbent stems among the new growth in many places made a very dense condition in which it was very difficult for the female to build. One was observed to start a nest in such a place, but it was not completed. Eight nests were in a small area of less dense vegetation, some in cattails and some in bulrushes; three nests in July were built in the stand of arrowhead and the fresh leaves and stems of the plant were used in the nests. At Mud Lake, 1932 and 1935, the nests were built chiefly with stalks of sedges and bulrushes. At neither season was Mud Lake so clogged with debris as Goose Lake in 1935. It would appear that a dense deposit of old stems of marsh vegetation which interfered with anchoring the nest to new vegetation prevented more satisfactory nesting.

The dimensions of the nests were about fourteen inches in diameter and about eight inches of material above the water, conforming with observations recorded by Bent (1926). Many of the nests had ramps of stems to enable the Coots to ascend to and descend from the nest. Fresh growth of rushes clogged with much old submerged material would not permit of building such ramps readily. Five to eight inches of each nest were below the surface of the water, and the nest was generally anchored to fresh vegetation. Such nests moved up and down with wave action and consequently did not become wet far above the water line. And thus also, drifting and submergence were prevented with sudden rises in the lake such as the 10-inch rise of Mud Lake on July 17 and 18, 1935, following a rainfall of 2.5 inches. Most of the nests rose with the water and remained safely anchored. Perhaps a balance between proper water depth for bulrushes, cattails,

nesting Coots, other marsh nesting birds, and muskrats may be ascertained. The muskrats of the correct number would prevent clogging of the marsh with excessive quantities of old stems of water plants, and help to provide open areas of water for feeding and other activities of Coots and ducks.

Data concerning the nesting dates and number of eggs were not so easily obtained. On June 25, 1932, twenty-two of the 189 nests on Mud Lake contained eggs, varying from one to twelve eggs in a nest and with a mean of between five and six eggs per nest. In 1935, during late June and July, Friley observed forty-two nests that had 292 eggs, a mean of between six and seven eggs per nest; the number of eggs per nest varied from four to eleven. At the same time eleven nests were found on Goose Lake, a marsh of eighty acres, and only three of them contained eggs, in number per nest three, four, and seven (Hendrickson, 1936). The mean number of eggs in a nest for all sixty-seven nests lies between six and seven.

In 1935 the latest date of hatching at Mud Lake was July 24, whereas on Goose Lake the latest date was probably in early August for a nest of four fresh-looking eggs was seen July 15 and the incubation period is twenty-one or twenty-two days as given by Bent (1926).

Records of the hatching from forty-two nests on Mud Lake, 1935, showed that approximately as many days were required for hatching of a single brood as there were eggs in a nest. For example, from one clutch of seven eggs the first chick hatched July 17 and the last on July 24; a freshly hatched chick appeared on each day except one. The adults were over the eggs regularly during the hottest hours of the day and at night. Perhaps they warmed the eggs during cooler hours and kept them cooler during the hottest hours in order to insure a rather uniform temperature of incubation. The hatching rate in 1935 reached the high point of 98 per cent among 292 eggs of forty-two nests.

Although the freshly hatched Coots usually remained on the nest until they were dry, a number of times young were seen to crawl out and fall into the water very soon after hatching. These birds started to swim immediately. The very young Coots appeared to be head-heavy and they intentionally dived very frequently and easily, if not at times accidentally. After several closely repeated dives, the young bird either lost its fear of the observer or became too nearly exhausted to dive again; or perhaps, as it often came up covered by plant material, the chick may have considered itself to be hidden. Although the hatching of larger broods was common the highest number of young ever seen on the water with a single adult was five, and two to four

were often observed as a probable brood. Perhaps accidental drowning accounted for a part of the high mortality among the chicks for in 1932 two very young Coots, after diving, became entangled in vegetation and might have drowned if they had not been freed by the observer.

Observations on the feeding of the captive young Coot were made in June, 1935, and Hendrickson (1936) told of the bird's preference for whitish food materials and demands to be fed rather than find and pick up food for itself. Later in the summer of 1935 Friley continued observations on feeding of the young in the open on Mud Lake. Adults with young around them were observed to dive and bring up blanched portions of vegetation. As soon as the adult came up the young rushed to take the food from its bill. Sometimes a tug-of-war followed the seizing of a large morsel by two chicks. Occasionally a young Coot dived and brought up food for itself, but as often the dive appeared to be unsuccessful. To what age the young continued to be fed by parents was not learned, but several broods known to be at least three weeks old were seen to take food regularly from the bills of adults.

The loss of Coots to predators was studied somewhat. Among several thousand Great Horned Owl pellets gathered in the vicinity of Mud Lake and other marshes of northern Iowa, Mrs. F. N. Hamerstrom found Coot remains in only twenty-two pellets, of which nineteen contained evidence of adult Coots and the others showed bones of young Coots. There was no direct evidence that muskrats were destructive to Coots though muskrats were occasionally seen to use Coots' nests as feeding stations. But it was not learned whether or not the eggs or young had been destroyed by muskrats. Bennett observed remains of young Coots in mink feces frequently in the vicinity of Mud Lake, during several recent summers.

The inter-relations between Coots and other marsh nesting birds were observed to some extent. In the summer of 1935, Mud Lake carried, in addition to about 100 pairs of nesting Coots, a colony of nesting Eared Grebes, over sixty pairs of nesting Pied-billed Grebes, at least twenty pairs of nesting American and Eastern Least Bitterns, ten Ruddy Ducks' nests, eleven Redheads' nests, numerous nesting King and Virginia Rails and Soras, numerous nesting Florida Gallinules, many nesting Forster's and Black Terns, many nesting Prairie and Short-billed Marsh Wrens, many nesting Yellow-headed Blackbirds and Red-wings, and numerous nesting Swamp Sparrows. A fairly heavy population of muskrats was supported on the lake that summer.

In the summer of 1932 there were at least twice as many Coots on the marsh, but no diving ducks, no Eared Grebes, and other species of birds were less numerous. Forster's Terns were seen often to attack Coots and drive them from the vicinity of terns' nests and young.

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BACHMAN'S SPARROW IN THE NORTH-CENTRAL PORTION OF ITS RANGE

BY MAURICE BROOKS

SCOPE OF THE STUDY

The latest (1931) edition of the A. O. U. Check-List gives the breeding range of Bachman's Sparrow (*Aimophila aestivalis bachmani* Audubon) as "Upper and Lower Austral zones in central Illinois (locally to southeastern Iowa), southern Indiana, southern Ohio, extreme southwestern Pennsylvania, and central Virginia south to central Texas, Louisiana, Mississippi, Alabama, and northwestern Florida." The present paper attempts a survey of this species as it occurs in West Virginia, southwestern Pennsylvania, and southeastern Ohio, with some notes on its occurrence in Virginia, Maryland, Kentucky, and Tennessee. It will be seen that this territory occupies a position in the north-central portion of the bird's breeding range, roughly midway between central Virginia and central Illinois. In the Check-List West Virginia is not specifically mentioned as within the breeding range, being included by implication only, nor is there any mention of Maryland. Data hereinafter included will show the regular (sometimes common) occurrence of Bachman's Sparrow in West Virginia, and its occurrence, at least occasionally, in western Maryland.

HISTORY

Within the territory covered by this paper the first record for Bachman's Sparrow was made in southeastern Ohio. Dr. Lawrence Hicks (in mss.) supplies the following data: "The first Ohio record was a specimen taken by Rev. W. F. Henninger on April 23, 1897, with others observed on May 3 and 6 of the same year, near South Webster in the Portsmouth region. The species was not heard from again until a specimen was taken by C. M. Weed August 18, 1900, at

Columbus. Next Miss Laura Gano found the species on April 25 and 27, 1901, near Cincinnati and subsequently obtained many sight records on Grosbeck Hill, Avondale, and College Hill, near Cincinnati. On April 23, 1903, Dawson collected a specimen on Rose Hill, near Cincinnati, in company with Miss Gano. This specimen is now in the Cincinnati Museum of Natural History.

"On June 10 and 11, 1903, Dawson found a nest of pure white eggs, and caught a juvenile bird near Sugar Grove, Fairfield County. From 1905 to 1915 there are no published records on the species, as there was practically no ornithological work done in the Ohio territory which this species occupies. Since 1915 much information on the species has been obtained, almost entirely by the various members of the Wheaton Club of Columbus."

In another paper Hicks (1935) states, ". . . it seems reasonably certain that this species has invaded the State [Ohio] from the south and southwest during the last half-century."

Writing in the WILSON BULLETIN in 1936, Miss Katie M. Roads records a nest with four eggs, pure white in color and presumably those of Bachman's Sparrow, which was found and called to her attention in Marshal Township, Ohio, in the spring of 1898.

In West Virginia Bachman's Sparrow made its first recorded appearance in Wood County, along the Ohio River, in late summer of 1903. Rev. E. A. Brooks (1912) states: "My first record of the occurrence of Bachman's Sparrow in West Virginia was made in Wood County, in late summer 1903. Since then it has become quite common in the northern and central parts of the State. Many were observed at Waverly, Wood County, from 1903 to 1907."

During the summer of 1907 individuals of this species were recorded in Upshur and Lewis Counties, near the central part of the State, and in Monongalia County, adjacent to the Pennsylvania border. F. E. Brooks found the bird at North Mountain, Berkeley County, in the Eastern Panhandle, on June 22, 1910, and A. B. Brooks records it from White Sulphur Springs, Greenbrier County, on May 15, 1913. The first West Virginia nest was discovered by Mr. Duffy Hornbeck, near Hinkleville, Upshur County, in July, 1913.

Speaking of the status of Bachman's Sparrow in Pennsylvania, Mr. W. E. Clyde Todd (in mss.) writes: "I added the species to the Pennsylvania list in the spring of 1910, when I secured an adult male specimen about a mile north of the town of Beaver. However, a nest with one egg, supposed to belong to this species, but never fully identified, had been taken near Waynesburg on May 16, 1909, by Mr. J. B.

Carter. Later research and travel by Dr. S. S. Dickey has revealed Bachman's Sparrow as a regular, even if not common, summer resident in various other parts of Greene County, while Mr. B. H. Christy has traced it to Allegheny and southern Beaver Counties."

Prof. W. W. Cooke (1914) records the occurrence of the species in southwestern Pennsylvania, and states that it reaches even northern Ohio. The first definitely determined nest of the species discovered in Pennsylvania came as a result of work done in Greene County by Dr. Dickey. Here he collected, on May 20, 1916, a set of five eggs. Two birds were collected by him, also in Greene County, in 1916. These are now deposited in the Academy of Natural Sciences at Philadelphia.

The data given above present strong evidence that Bachman's Sparrow reached the territory covered by this paper through an invasion from the south and southwest, following roughly the valley of the Ohio River. It may well be that birds moving northeastward from the Ohio into central West Virginia moved down the valley of the northward-flowing Monongahela, reaching Monongalia County, West Virginia, and Greene County, Pennsylvania, by this route.

Hicks, as has been stated, considers that the movement into Ohio was an invasion, although he believes that the species might have been overlooked for a number of years. Cooke (*loc. cit.*) speaks of the northward movement of the species as an "invasion". In central West Virginia, particularly in Upshur County, competent field workers covered the territory for twenty years before Bachman's Sparrow was discovered, and it seems impossible that they would have overlooked so outstanding a songster. A glance at the accompanying map will show the regular northeastward progression of the discoveries made in the territory covered by this paper.

There are evidences which point to a more general northward movement of the species during the early years of the twentieth century. Eifrig (1915) found several individuals near Chicago, Illinois, in May, 1915, and he is sure that the birds had not been previously overlooked. Leopold (1923) states, "The latter [species, Bachman's Sparrow], a southern form, has only recently been found to nest at River Forest, near Chicago, where its numbers increase each year." Mr. W. E. Saunders (in Canadian Field Naturalist, XXXIII, No. 6, p. 118)) records the first specimen of Bachman's Sparrow ever taken in Canada, a male from Point Pelee, Essex County, Ontario, Canada's most southern extension.

This invasion apparently reached its limits in our area about 1915; the period of maximum abundance, at least in West Virginia and Pennsylvania, being reached between 1915 and 1922. From that time until the present, a number of observers have noted marked decreases in Bachman's Sparrow populations. Dickey (as quoted in the manuscript of Mr. Todd's forthcoming "Birds of Western Pennsylvania") states: "In recent years (i. e., since 1922), however, although I have often been afield (in Greene County), I have failed to meet with this species. Either it has dwindled in numbers, or I have completely overlooked it."

Professor E. R. Grose, of Glenville State Teachers College, in conversation with the writer, states that he has not been able during the last few years to find the birds in places in Upshur and Gilmer Counties, West Virginia, where fifteen years ago they were common.

Professor C. R. Bibbee (1934), in collecting work done for the West Virginia University Museum during 1923-26, failed to find the species at all, although much of his work was done in Wood County where the original discovery in the State was made.

The writer (1934) records sharp decreases in numbers of the birds in Upshur County, and similar observations have been made in other parts of the State. Conclusions of A. B. Brooks and Fred E. Brooks, both with wide experience in West Virginia, are along similar lines.

During recent years Haller and the writer have found the species in small numbers in Monongalia County, West Virginia, and Haller has collected a specimen in Ohio County, West Virginia, in 1934, and another in Wayne County, West Virginia, in 1937. A single individual was heard singing in Upshur County during 1935. Christy has in some recent years found small numbers of the birds in Beaver County, Pennsylvania.

It seems reasonable that a similar recession in numbers has occurred in Ohio, but Dr. Hicks makes no mention of it, and the writer cannot find positive evidence to support such a conclusion. Perhaps the best indication that such may have been the case is found in the fact that in only a very few Ohio counties does Hicks consider Bachman's Sparrow even tolerably common at present. While I have no similar Ohio evidence, it is certainly true that the species was common to abundant in some West Virginia counties fifteen years ago.

Range

Hicks (1935) says of Bachman's Sparrow in Ohio, "It now occurs in numbers locally in 32 counties of southern and eastern Ohio (mostly

unglaciated Allegheny Plateau)". In a latter paper (1937), and in correspondence, he furnishes data from seven additional counties, so that the Ohio county list would now read as follows:

Hamilton, Clermont, Brown, Adams, Scioto, Lawrence, Butler, Warren, Clinton, Highland, Pike, Jackson, Gallia, Montgomery, Greene, Fayette, Ross, Vinton, Meigs, Pickaway, Hocking, Athens, Washington, Franklin, Fairfield, Perry, Morgan, Noble, Monroe, Licking, Muskingum, Guernsey, Belmont, Knox, Coshocton, Tuscarawas, Ashland, Holmes, and Wayne.

Only one of these, Wayne County, where Bachman's Sparrow is regarded as very rare, lies entirely outside the unglaciated Allegheny Plateau. Most of the territory occupied by the species would be referable to the Carolina faunal zone, with here and there a hint of Transition conditions.

Distribution of the species in West Virginia (at least so far as we now know it) offers a far more irregular picture. The list of counties where breeding birds have occurred is as follows:

Wayne, Cabell, Putnam, Kanawha, Fayette, Greenbrier, Mason, Jackson, Roane, Clay, Nicholas, Wood, Wirt, Calhoun, Braxton, Webster, Ritchie, Gilmer, Lewis, Upshur, Randolph, Doddridge, Harrison, Barbour, Taylor, Marion, Monongalia, Preston, Hardy, and Berkeley.

Of these counties, most are in the western portion of the State, near the Ohio River, but there are a number of interesting exceptions. Through the valleys of the Great Kanawha River, and its tributaries, the New and Greenbrier Rivers, the species under consideration has been able to cross the State from the Ohio River to a point (White Sulphur Springs) very close to the Virginia line. In northcentral West Virginia the species came into the valley of the Monongahela River, and apparently used it for a northward movement. The higher ranges of the Allegheny Mountains seemingly serve as an effective barrier to eastward movement, and we have but two records from the eastern slopes of these ranges. Of these one was made by Fred E. Brooks at North Mountain, Berkeley County, on June 22, 1910; the other was made by the writer at Wardensville, Hardy County, on July 6, 1925. Both of these points lie within, or close to, the Shenandoah Valley. Dr. J. J. Murray and others have found Bachman's Sparrows somewhat farther south in the Valley, and it may be that these were birds which had moved north by that route rather than having crossed the mountains. Naturally, these are but surmises.

Perhaps the most striking feature of the bird's range in West Virginia is to be found in the altitudes to which it has attained. Near

French Creek, Upshur County, where much intensive work has been done, the species was positively common at elevations of 1700 feet. In Webster County a number of individuals were observed at altitudes around 2500 feet. Recent observations in Monongalia County have been at nearly 2000 feet, while individuals have been noted in Preston County at elevations well above 2000 feet. Both these latter counties are adjacent to the Pennsylvania line. The altitudinal record for the State, so far as I am aware, was made near Pickens, Randolph County. Here, on Turkeybone Mountain, at elevations around 3000 feet, the

FIG. 17. Map of the area treated in Mr. Brooks' paper on Bachman's Sparrow.

birds were found in 1920, and perhaps in other years. The territory thereabout lies within the "Spruce Belt", the natural growth of Red Spruce (*Picea rubens*) which followed the higher Allegheny summits. At the time the Bachman's Sparrows were found, the area had, of course, been cleared, but Winter Wrens, Veerys, Magnolia and Cairns's Warblers, Juncos, and Red-breasted Nuthatches all nested nearby.

Robert L. Mason in his "Lure of the Great Smokies" (p. 312) records Pine Woods Sparrow (*Aimophila aestivalis aestivalis*) from the open areas atop some of the Great Smoky Mountain peaks, but I can find no recorded instances of Bachman's Sparrow breeding at high alti-

tudes elsewhere than in the territory covered by this paper. Mr. H. P. Ijams states (in correspondence) that in his experience in eastern Tennessee he does not know of the bird outside the Carolina Life Zone.

Freer (1933) tells of finding individuals of this species on some of the Blue Ridge summits in Virginia, but assumes that they were migrants. Bruner and Field (1912) found Bachman's Sparrow in the Transition Zone (2000-5000 feet elevation) in western North Carolina, but no evidence is presented that the birds were breeding there.

In this connection mention should be made of an observation on Bachman's Sparrow made in Garrett County, Maryland. The author found in June, 1923, and recorded (1936) a male in full song near Oakland. This is on that part of the Allegheny Plateau known locally as the "Tableland", and has an elevation of about 2600 feet. Garrett County forms the extreme western extension of the State, and is near enough the Monongahela Valley (being in part within that drainage system) so that stray birds might have found their way there from points of lower elevation.

Whatever its range and habitat may be elsewhere, there can be no doubt that in West Virginia at least Bachman's Sparrow has been at times a common breeding species in many regions which have been placed in the Transition Zone, and has invaded regions definitely within the Canadian Zone.

Two regions of seeming promise in West Virginia await further study. There is in the southwestern portion of the State, along the Big Sandy River and its tributaries, a considerable territory which is, biologically speaking, virtually unexplored. Dr. Murray quotes Mr. F. M. Jones as saying that Bachman's Sparrow is "a summer resident in restricted areas in southwestern Virginia". Since the West Virginia territory mentioned above is directly adjacent to southwestern Virginia, the need for field work there is strongly indicated. Another area which had virtually no ornithological attention during the time when Bachman's Sparrow was most common in the State is the tier of counties along the Ohio River north from Wood to Brooke (where Dr. George M. Sutton failed to find the species during his extensive observations there). No records for the species (save Haller's recent one in Ohio County) exist in this area.

According to Mr. Todd's studies, the known Pennsylvania range for this species is a somewhat discontinuous one. Dr. Dickey and Mr. J. Warren Jacobs have noted the bird in Greene County, and Mr. Todd and Mr. Christy have found it in Allegheny and Beaver Counties. There are, apparently, no records from Fayette and Washington Coun-

ties, although the presence of the birds there might be expected. The strong probability suggests itself that the Pennsylvania invasion may have taken place through the Monongahela, rather than through the Ohio Valley. The fact that there are no Ohio records along the river north of Belmont County; the apparent absence of the species in Washington County, Pennsylvania*; and the point mentioned that Sutton has failed to find the birds in the Northern Panhandle of West Virginia (along the Ohio River), all suggest the Monongahela route, particularly when it is known that the species was fairly common in Marion and Monongalia Counties, West Virginia, and in Greene County, Pennsylvania. That no Fayette County, Pennsylvania, records exist may be due to lack of field work there. Mr. Todd (in mss.) concludes as to species, "Its local range in our region will probably be found to approximate those of such species as the Mockingbird, Carolina Chickadee, etc."

Migration

From the records available, it seems that Bachman's Sparrow arrives in our territory fairly early in the spring, and leaves during late summer or early autumn. Cooke (1914) lists the following spring arrival dates from Ohio: Cicninnati, two years; average April 24, earliest April 23, 1903; Cedar Point, May 14, 1909.

Hicks (in correspondence) writes as follows: "Our Wheaton Club records for the Columbus region, which includes some of the Sugar Grove hill country near Lancaster, have eleven years of spring migration records on the species. The earliest spring date is April 10, 1925, although I have taken it at Portsmouth as early as April 2. The median spring arrival date is April 22. The median fall departure date is August 17, and the latest known date of departure August 28, 1931, although again I have taken it in Adams County in southern Ohio as late as September 2."

From West Virginia, E. A. Brooks (1912) gives the median spring arrival date of the species at Waverly, Wood County, for five years (1903-07) as April 25. At French Creek, Upshur County, spring arrival dates for ten years are available. The earliest is March 27, 1921; the median date is April 11; and the latest is April 22, 1926. Conditions for observation here were exceptionally favorable, since

*Mr. Bayard H. Christy, of Sewickley, Pa., informs me in correspondence that on July 21, 1935, he found a singing male Bachman's Sparrow in Hanover Township, Washington County, Pa., just across the line from Beaver County. Revisiting the area two days later, he again found the singing male, and another bird which he took to be the female. She had dried grass in her beak, but no further indications of a nest or young birds could be found.

one or more observers were in the field every day in country frequented by the birds. Regular departure data were not gathered at French Creek, but I can find no mention of the species in field notes after September 1. In view of the late nestings (recorded further on) young birds must have taken their departure very soon after sustained flight was possible.

Pennsylvania migration records are few, but Mr. Todd notes that Dr. Dickey found two singing males (probably new arrivals) near Waynesburg, on April 15, 1922. He thinks also that the bird which he secured at Beaver, on April 29, 1910, may have been a new arrival.

The following spring arrival dates given by Cooke (1914) are for points near enough our territory to be of interest: Lynchburg, Virginia, April 7, 1901. Washington, D. C., two years; earliest date of arrival, April 26, 1914; average date of arrival, April 27. Rockwood, Tennessee (near), three years; earliest date of arrival, April 3, 1884; average date of arrival, April 7. Eubank, Kentucky, seven years; earliest date of arrival, March 20, 1889; average date of arrival, April 6. Bicknell, Indiana, four years; earliest date of arrival, March 19, 1908; average date of arrival, March 25. Bloomington, Indiana, four years; earliest date of arrival, April 6, 1884; average date of arrival, April 11.

Habitat

Every observer from North Carolina and Tennessee northward would agree, I believe, that Bachman's Sparrow is decidedly local in its distribution, highly selective in the places it chooses for breeding territory. I quote at some length from the excellent notes pertaining to this species in Ohio furnished by Dr. Hicks: "The Bachman's Sparrow is a most interesting species. I have it on my list of twenty species on which I have been doing special ecological distribution work. There are few, if any, Ohio breeding species which are as fascinating.

"A person acquainted with the ecology of the species can readily find twenty-five birds for every one located by the 'hit and miss' method. The species could hardly have existed in Ohio before the white man came, except about a few prairie openings, the only extensive ones of the Bachman's type being in Adams County. The cutting of the forest, soil erosion, and the abandoning of farms have favored the species. It is practically never found in a field until at least four years after cultivation has ceased. Also, it is practically confined to hill country, although it occurs in a few areas where the hills are relatively low—practically never in valleys or on the lower slopes. Usually

it is found on those ridge tops which drop away sharply in a divide to either side.

"The choicest locations are about fifty to one hundred yards down from the ridge tops in old deserted fields. A typical territory is a circle 150 feet each way from an eroded gully which has healed and is now well covered with miscellaneous trees, shrubs, and particularly blackberry brambles. The territory is more attractive after about five per cent of the open grass lands adjacent to the gullies are dotted with blackberry briers. Usually the center of the territory is close to the upper end of the gully, and the abundant plants are the dry soil goldenrods and asters, wild oat grass (*Danthonia spicata*), and various other grasses, composites, and miscellaneous weeds typical of dry eroded slopes. A good water supply, with humid and fertile soil, soon produces a vegetation set-up too dense for this species.

"The species occurs in some sites like the one described above where seedling pines also occur, but there is no indication that pines add anything to the attractiveness of the habitat.

"Another common vine in these areas is *Smilax glauca*, and other shrubs include three species of sumac" (*Rhus typhina*, *Rhus glabra*, and *Rhus copallina* (?) auth.).

In West Virginia both E. A. Brooks and A. B. Brooks make mention on numerous occasions of finding the birds in fields partially grown up to briers and shrubs. In the Upshur County territory with which I am most familiar, the habitat picture for the species is almost an exact duplicate of that described by Hicks as typical. One field where several nests were found occupied both slopes of an eroded ravine, the vegetative cover including as principal species beard grass (*Andropogon*), goldenrods, asters, daisies, fleabane (*Erigeron*), and other composites, greenbriers (*Smilax*) of several species, blackberry, and such shrubs as sumac, crabapple, hawthorne (*Crataegus*), and flowering dogwood (*Cornus florida*). Black walnut, white oak, tulip poplar, and red and sugar maples were beginning a forest invasion. In this field of approximately twelve acres there were at least four singing males during the summer of 1920, and two nests were found in the same area in the summer of 1925.

The experience of Miss Eva Fling and Harold Roush in Marion County is apparently somewhat different. Writing from Fairmont, West Virginia, in 1916, they say, "Found this sparrow [Bachman's] in a large grassy cove. . . . Fairly common in open fields all during the summer." In other notes made the same year they state, "We found this bird inhabiting large grassy fields and 'coves' on the road to

Smithtown, about four miles from Fairmont. Tolerably common in this locality."

Since West Virginia has no prairie land, and had, before the coming of the settler, almost no open lands of any description, it is obvious that this species could not have found here, prior to clearing operations, territory suited to its peculiar needs. This fact will be of assistance in explaining the invasion which apparently took place.

Mr. Todd (in his manuscript of "Birds of Western Pennsylvania") quotes as follows from Dr. Dickey's notes on the Pennsylvania habitat of Bachman's Sparrow: "In southwestern Pennsylvania it is partial to open, scattered groves of white, red, and black oaks, and to waste fields grown up to poverty grass (*Danthonia spicata*), intermixed with briers, saplings, small shrubs, and herbage.

"My first experience with this sparrow was in the summer of 1913, when with two companions I was engaged in trying to locate some old Indian trails across Greene County. On July 29, southwest of Kirby, a new bird song attracted my attention. It came from an open grove of old white oaks where the ground beneath was covered with poverty grass. After some maneuvering I contrived to spot the singer, which was perched on some dead branches, and to identify it satisfactorily as a Bachman's Sparrow. During the next two days our journey took us across hills and valleys into the general vicinity of Brock and Rosedale, and two more males were encountered—one in a waste-field grown up to poverty grass, briers, and saplings, on the north side of the valley of Dunkard Creek; the other in a rolling pasture about four miles west of the Monongahela River and only a half-mile from the West Virginia line.

"Later experience with this sparrow has confirmed its observed liking for sterile fields and open oak groves. It thus occupies an ecological niche which is, generally speaking, otherwise unattractive to bird life."

From observers in areas near to the territory covered in this paper come pertinent notes on the habitat of Bachman's Sparrow, most of them in general agreement with observations already quoted. Mr. Harold H. Bailey, in his "Birds of Virginia" speaks of his bird as "inhabating the more open pine woods, where it places its nest on the ground, well concealed by low vegetation". Dr. Murray also speaks of it in Virginia as "frequenting open, scattered pine woods, as farther south". Mr. Ijams, writing of this sparrow near Knoxville, Tennessee, tells of a field where some years ago a few pairs could be found during the breeding season. He describes the territory as "rocky hill pasture,

FIG. 18. Nest of Bachman's Sparrow near Hinkleville, Upshur County, West Virginia. Note the open construction, with no doming or arching.

FIG. 19. Nest of Bachman's Sparrow parasitized by a Cowbird. The nest is completely open. French Creek, Upshur County, West Virginia.

with thorny shrubs and blue grass". Dr. Jesse M. Shaver, writing from Nashville, Tennessee, says, "This species occurs with the Field Sparrow in old fields, especially those which have much broom grass (*Andropogon*), or many shrubs forming an early stage of shrub invasion". From the region of Bowling Green, Kentucky, Dr. Gordon Wilson, of Western Kentucky State Teachers College, speaks of this species as "found only in very restricted areas".

Nesting

The pure white eggs laid by Bachman's Sparrow make its nest an object of special ornithological interest. Ground-nesting passerine birds are not, generally speaking, given to laying white eggs, and most ornithologists in the territories where these birds breed will search long and diligently for a nest. Even where the birds are fairly common, however, nests are by no means easy to find. From my own experience I think of them as being in the same category (so far as difficulty of detection is concerned) as the nests of Grasshopper or Savannah Sparrows. Since all of the habitat notes quoted in the last section apply to breeding birds, it is obvious that much of the information there given is also pertinent at this point.

No other person in our territory, so far as I am aware, has had opportunities for studying the nesting of this sparrow that have come to Dr. Hicks, both through his own observations, and through the activities of the Wheaton Club. I quote again from his voluminous notes: "I have found about twenty-six nests in all, *only two of which seemed to me to be clearly domed* [italics the author's] as the nest of the Meadow Lark would be, although about one-half were built somewhat higher on one side. Many of the nests found have not been followed up, but I have survival data on most of them, and find that the percentage of success is distinctly higher than that which Mrs. Nice has found for the Song Sparrow, and which I have found for the Field Sparrow and the Vesper Sparrow.

"The causes of predation losses we now know to be rather complex, and not so easily explained as being due to the color of the eggs. I doubt very much if the species' nesting success would be significantly altered if the eggs looked like those of the Vesper Sparrow."

In West Virginia I have had opportunity to observe eight nests, and have received partial data on two more. In every case the nests found have been in such territory as is described under "Habitat". Most of the nests were found by accident, although at least one was discovered by watching the parent birds.

Perhaps the most striking feature of all the nests which I have seen is that not one of them has been distinctly domed or arched. Bendire (1888) states that *all* nests of this species are domed and cylindrical, and later writers have generally followed him in this description. The nest of Pine Woods Sparrow (*Aimophila aestivalis aestivalis*) is described by Bendire as "not arched over in any way, perfectly round, with the sides or rims everywhere of equal height".

Hoxie (1910) tells of finding a nest in Chatham County, Georgia, which (from the singing of the bird) he assumed to be that of Bachman's Sparrow. When the nest was examined, however, it proved to be open, not domed, and he concludes that it must have been the nest of Pine Woods Sparrow, although he raises a question as to the breeding of the two birds in the area. The first record which I can find of an undomed nest definitely ascribed to Bachman's Sparrow is one mentioned by Simons (1915). He tells of finding a nest of this species near Buffalo Bayou, Texas, on April 25, 1914, and speaks of it as "not arched or roofed over".

Whether or not it may be a peculiarity of those birds which come farther north to breed, Dr. Hicks' experience, together with my own, seems to indicate that domed nests in our territory are distinctly unusual. I have seen several nests that were built higher on one side, but none of them could be fairly referred to as "cylindrical". Reference to the accompanying photographs will show the open character of most of the nests which I have seen.

I quote from the correspondence of Dr. Paul R. Cutright, now of Beaver College, Jenkintown, Pennsylvania. Writing from Hinkleville, Upshur County, West Virginia, in July, 1914, he says: "I went over yesterday evening (July 10) to see the Bachman's Sparrow's nest, but it had been destroyed. It was near the place where the Hornbeck boys found a nest last summer. The nest was in good shape, and one of the eggs was found a few feet from it. One side of the egg was broken, and we could not save it. The nest was practically all formed from grass, with a few horse hairs in the lining. Like the one last year, it was on the ground in a bunch of broom sedge, and open, although Chapman says the nest is domed. I believe that it could be compared in size with the nest of the Song Sparrow. There were four eggs in each nest."

The first nest found in West Virginia (referred to above) was the discovery of Mr. Duffy Hornbeck, near Hinkleville, in July, 1913. After the eggs had hatched a single infertile egg was collected and placed in the collection of Mr. Orr King, Weston, West Virginia. It

measured .75 x .60. Another nest, with four eggs, was found in the same locality by Mr. Hornbeck, and was photographed by F. E. Brooks on July 19, 1918.

Nests with eggs were found near French Creek on the following dates: May 27, 1919; May 30, 1922; June 11, 1925; July 17, 1925; and July 2, 1926. All contained four eggs save one (see accompanying photograph) which contained three eggs of Bachman's Sparrow and one Cowbird egg. Of the eight nests, the first, found by Mr. Hornbeck, was successful, except for the one infertile egg mentioned; the second, as described by Dr. Cutright, was destroyed; the third (1918) was successful; the fourth (1919) was destroyed; the fifth (1922) was parasitized by a Cowbird, and the parents abandoned the nest after the Cowbird's egg was removed; the sixth (June, 1925) was successful; the seventh (July, 1925) was destroyed; and the eighth (1926) was destroyed, by a blacksnake in this instance. Thus three nests were successful, or partially so, and five were destroyed or abandoned. These data are not sufficiently numerous to justify any conclusions as to predation, and it must remain for further study to determine whether or not pure white eggs are a handicap to this ground-nesting bird.

The fact that two nests were found in May and five in July would seem strongly to indicate that in our territory at least many pairs have two broods annually. Bendire (1888) believed this to be true of the birds farther south as well. No banding was done in our studies, but singing males occupied the same territory, so far as we could determine, from April until July or August. In view of the fact that observers are in agreement as to the early southward migration of the species, it would seem that late July broods would be somewhat hurried in their activities.

As mentioned previously, at the height of their abundance in the Upshur County territory four pairs (possibly five) occupied a field of approximately twelve acres. One male whose nest was discovered had a favorite singing perch in a small walnut tree about fifty yards from the nest. The birds were not crowded in their territory, and we found some points from which habitual singing was carried on at distances of seventy-five to one hundred yards from the nest.

Brooding birds were found to sit very close, allowing themselves to be approached within a few feet before flushing. When flushed, the bird would frequently drag its wing, flutter along the ground, and, in general, go through a performance that we have come to think of as "injury-feigning". I write this with fear and trembling in view of the fact that observers with many times my experience have stated that

they have never noted a clear case of "injury-feigning" in a passerine bird. Nevertheless, I have noted a performance similar to that described above from Vesper, Grasshopper, and Lark Sparrows, as well as from the species under discussion. I do not insist that this is necessarily "injury-feigning", but it is much like the performance of a Killdeer in leaving her nest.

Parent birds do not fly directly to the nest, but, in common with some other ground-nesting sparrows, drop inconspicuously into the grass and weeds from low perches at some distance from the nest, making their approach in such a manner that it is very difficult to follow them. In one case where we found a nest by watching the birds the habitual approach was from an old rail fence about thirty feet from the nest. Bushes along the fence-row gave us some concealment, and we watched for a long time until we became reasonably certain of the approximate location of the nest. Both parents were carrying insects to the young birds, and they were shy and secretive. When the nest was located (it contained four young birds) both parents nervously flew from low perches in weeds and grass to the ground, remaining within sight for very brief intervals. Presently one of the adults (the male?) flew away, and he did not return so long as we were in the vicinity of the nest.

Dr. Dickey (as quoted by Mr. Todd) writes of his experience in Greene County, Pennsylvania: "Some four years before I personally met with the species (1909), however, Mr. J. B. Carter had stumbled across a strange nest in a hillside field adjoining an oak copse, close to Waynesburg. It had somewhat the appearance of a nest of the Grasshopper Sparrow, and was tucked in a tussock of dead grass near a thicket. It held but one egg, pure glossy white in color, which measured .74 x .53. The discovery of this nest gave me some pause. It was apparently deserted, but seemed not to belong to any species with which I was then familiar. Subsequent disclosures, however, pointed to its being the nest of Bachman's Sparrow—the first actual case of the breeding of this species within our borders.

"On May 10, 1916, while traversing a grove of white oaks just north of town—I saw a small brown bird fly up from the ground into a tree, and burst into a song that at once disclosed its identity as a Bachman's Sparrow. Soon his mate joined him, and the pair dallied about the grassy plots and then went into a nearby pasture with scattered hawthorne shrubbery. Returning to the spot two days later, I found the female gathering material for her nest, the location of which was thus betrayed—in a clump of dry poverty grass in a wide aisle of

the grove. On May 20 I again returned and collected the nest with a set of five fresh eggs. The nest was a *dome-shaped* [italics the author's] affair with a foundation of dry grass-stems and blades. It was rather loosely arched over, and was lined with finer grasses and horsehair. The eggs were white with a faint bluish cast, and were slightly glossy in texture. The parent birds divided their time between the oak trees and the ground, feeding in both; they repeatedly perched in plain sight, manifesting little fear."

Dr. Shaver, Mr. Ijams, Dr. Wilson, and other observers in nearby territory testify to the difficulties involved in finding nests. Dr. Wilson states that he has never been able to locate a nest of this species in Kentucky. Mr. Ijams does not mention seeing a nest in eastern Tennessee, and Dr. Shaver says that he has seen very few in that State. In a list of seventeen records from the vicinity of Washington, D. C., and from nearby points in Virginia and Maryland, furnished me by Dr. H. C. Oberholser, there are few if any mentions of nests having been found.

Four eggs seem to be the usual number in our territory, all the nests which I have seen, save the one parasitized by a Cowbird, having that number. Nests with three eggs have been noted, however, and Dickey in Pennsylvania and Bailey in Virginia record occurrences of five eggs.

Song

Many writers have paid tribute to the musical ability of Bachman's Sparrow, but few persons who are acquainted with it will believe that any verbal description, or transliteration, will do it justice. Those who have been so fortunate as to hear Dr. A. A. Allen's recent recordings of the song of Pine Woods Sparrow will have a better idea of the almost identical Bachman's Sparrow notes. No recording, however, can catch all its qualities and variations, or bring out the whispered notes that add so much charm to the efforts of the singer.

Dr. Frank M. Chapman (in "Handbook of Birds of Eastern North America", Second Rev. Ed.) writes of Pine Woods Sparrow: "When singing it seeks an elevated perch" [by no means always true in the case of Bachman's Sparrow. Auth.]. "In my opinion its song is more beautiful than that of any other American Sparrow. It is very simple . . . but it possesses all the exquisite tenderness and pathos of the melody of the Hermit Thrush; indeed, in purity of tone and in execution

I should consider the Sparrow the superior songster. It sings most freely very early in the morning and late in the afternoon, when the world is hushed and the pine trees breathe a soft accompaniment to its divine music."

Writing this time of Bachman's Sparrow, the same author quotes Ridgway as finding its song somewhat like the "plaintive chant of the Field Sparrow, but as far sweeter and louder, the modulation, as nearly as can be expressed in words, resembling the syllibles *théééééé-thut, lut, lut, lut*, the first being a rich, silvery trill, pitched in a high musical key, the other syllable also metallic, but abrupt, and lower in tone".

Such a transliteration as that given above might well represent one common variant of the song, but it is far from telling the whole story. A much fuller, and, to the ears of this author at least, a much more precise description is that given by Strong (1918). He records: "The bird sang with only short rests, and the duration of the song which was very variable, was about two to three seconds. Usually the song started with a single long note followed by a group of short notes in a tempo so fast that we could not be sure of our count. So far as we would determine, the bird had seven to twelve notes in this group, usually about ten. As a rule, they were of essentially uniform pitch, but not of the same pitch as the long opening note. The pitch was sometimes lower than that of the first note and sometimes higher. A few performances had two or three opening notes not so long as the usual, single one. On one occasion, the song was repeated or rather one song followed another with no interruption or pause, both being a little shorter than usual.

"The quality was remarkably variable, but it tended to be fairly uniform in a single song. Sometimes the series of rapid notes was thin and resembled somewhat the song of a Junco. At other times it was relatively rich and full. Intermediate grades of quality occurred."

To me, the most notable quality of this sparrow's song is its wide variation. A person hearing a single song might, as many persons have, compare it with the song of the Field or Vesper Sparrow, even with one two-note song of the Chewink, but not from them would come this change in pitch, arrangement, tempo, and modulation. Definitely, there is a song-sequence, no two sequences being exactly the same, but each with a recognizable pattern. Each may contain ten or more separate songs, showing five, six, or more variations. The louder songs are

not uncommonly interspersed with "whisper songs", so low that they are inaudible to a person at a little distance. Frequently there are broken twitterings between the more ordered songs as well. As with many of our fine songsters, individual birds show wide variations in their vocal abilities.

A. B. Brooks writing of this bird from Morgantown, West Virginia, in May, 1907, observes: "He was near the same place where we had heard him singing before. The field where he stays is covered over with little tufts of weeds and brush. After I had listened to his song as long as I wanted to, I followed him for a while. He would hide in these tufts of weeds and grasses, and would allow me to walk up within two feet of him. He can beat any sparrow by half that I have ever heard when it comes to singing. I give some marks which will illustrate the song of the bird as I heard it. I took these down as he sang." (Here follows a diagrammatic representation of the song-sequence which shows seven variations given in a series of twelve songs). "When I approached a little nearer he discovered me and changed his song into a fine, mixed-up combination of slurs, whistles, and thrills."

At French Creek, Fred E. Brooks notes that on the evening of April 15, 1923 (the recorded date of arrival for the species at that place), he heard a whole series of songs given on such a high pitch that they were almost inaudible. He also mentions hearing a "whisper song" a number of times.

Mr. Todd, in conversation, tells of first hearing the song in Florida in 1903, and of recognizing it instantly when he unexpectedly heard it again near Beaver, Pennsylvania, in 1910. He also quotes Dickey to the effect that the song carries so well as to be audible, under favorable circumstances, at distances of half a mile. Earle A. Brooks speaks of the song as unforgettable, once heard.

Apparently the birds are well within their song-cycle when they arrive in our territory. Singing begins immediately, and is continued frequently until well along in July. Dickey notes a singing bird on July 29. I have heard their songs, given infrequently, a few times in August. Early morning and late afternoon seem to be preferred as singing times, but one of my most acute boyhood recollections has to do with the song of this bird, together with that of the Field Sparrow, coming to me through the heat as I picked blackberries under a blazing July sun.

The singing bird usually chooses a low perch, frequently a rail fence or a clump of bushes. I have heard the song given from perches thirty to fifty feet above the ground, and I am reasonably certain that I have heard it given a few times directly from the ground. There is a possibility, however, that in these cases the singing bird may have hopped up on some low weed as the song was delivered.

The hill country of which we are writing frequently has periods of chilly weather, with occasional heavy snows, after Bachman's Sparrows arrive in the spring. As with other birds, these sparrows frequently interrupt their singing during these cold spells. I have known singing to cease for a period of nearly two weeks, but I have several times heard songs, usually given spasmodically, when the temperature was near the freezing point.

Like Field Sparrows, these birds frequently sing on moonlit nights, the richness and beauty of the music intensified by the attendant circumstances.

General Notes

As a general rule, my experience with Bachman's Sparrow would lead me to regard it as a shy bird, difficult to observe. It has well developed the sparrow habit of dropping from some low perch when approached, and skulking away in the grass and weeds. Were it not for the unmistakable song, I can well realize how it might be overlooked in any given territory for a long time. Dickey, however, mentions finding the birds easy to observe about their nests, and, as already quoted, A. B. Brooks tells of a male that allowed approaches within two feet.

I have recorded briefly elsewhere (1934) a most unusual opportunity for observing the birds which came to us on our Upshur County farm during May, 1925. Much to our surprise, a pair of the birds, evidently nesting in a nearby brushy field, began frequenting one of our window feeding shelves. No similar circumstance had come to our attention, and we tried a variety of foods with the birds. They took raisins freely, but, like so many birds which we have fed, seemed to prefer the kernels of black walnuts to any other food which we could offer them. They also took coarse corn meal, cornbread, particles of cracked corn in ordinary poultry feed, and "cracklings" left from the "trying-out" of lard.

Both birds fed at the small shelf at the same time, and, once they had come, manifested little fear. They would sometimes remain for periods of five minutes or more, feeding both on the low shelf and on the ground where particles of food had been scattered. Visits continued for about three weeks, but, whether or not they were giving full attention to the problems of nesting, the birds came more and more infrequently. We did not see them at the shelf very early in the morning or late in the evening, the times when singing was most in evidence.

Stoddard (in "The Bobwhite Quail", p. 58, 1931) speaks of the frequency with which bird dogs "false point" Bachman's Sparrows. Dog handlers, he says, commonly refer to these birds as "stink birds". Since these sparrows are not found in our territory during the open season on quail, and particularly in Ohio, where quail hunting is prohibited by law, such observations by hunters in this section would necessarily be infrequent. I have heard dog trainers in this area speak of their dogs pointing "ground sparrows", and it is possible that the present species was the bird meant.

Bendire (1888), in the first lengthy account of Bachman's Sparrow, quotes Dr. William C. Avery, of Greensboro, Alabama, as having noted peculiar actions from the birds when flushed from the nest. He states that the flushed bird invariably runs (not flies) away from the nest, and that it imitates the movement of a snake, even giving at this time a distinct hissing note. While the present author has not heard the hissing note mentioned, the actions described by Dr. Avery correspond closely with those described as apparent "injury-feigning" in this paper. Dr. Avery also speaks of flushing four juvenile birds which flew like a covey of miniature Bobwhites, rising with an audible whir of wings, and he has noted this same sound from adult birds when they were flushed suddenly.

When distinctly domed nests are built this method of construction would seem to present difficulties to Cowbirds seeking to parasitize the nests. As mentioned earlier, however, one of the nests which came under my observation held a single Cowbird egg, and Woodruff (1907) tells of finding a nest in Carter County, Missouri, which held two eggs of Bachman's Sparrow, and three eggs of the Cowbird.

Specimens of Bachman's Sparrow from a part of the territory coveered by this paper (West Virginia and Pennsylvania) have been examined by Dr. H. C. Oberholser, U. S. Biological Survey, Washington,

and have been found by him to be identical with examples from the South-Atlantic coastal regions. Various Ohio museums have a number of specimens taken in that State; Mr. Todd mentions the example taken by him near Beaver, Pennsylvania, in 1910, now in the Carnegie Museum in Pittsburgh, and there are two specimens taken by Dr. Dickey in Greene County in 1916, now in the Academy of Natural Sciences, Philadelphia. In West Virginia, Fred E. Brooks took a specimen at French Creek in 1911, the skin now being in the Carnegie Museum collections, and Karl Haller has two West Virginia specimens in his collection, one taken in Ohio County in 1934, the other taken in Wayne County in 1937.

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Valuable notes were furnished by Mr. J. Warren Jacobs, Waynesburg, Pennsylvania; Dr. Gordon Wilson, Western Kentucky State Teachers College, Bowling Green, Kentucky; Dr. Jesse M. Shaver, George Peabody College for Teachers, Nashville, Tennessee; Mr. H. P. Ijams, Knoxville, Tennessee; Mr. Bayard H. Christy, Sewickley, Pennsylvania; Dr. James J. Murray, Lexington, Virginia; and Professor E. R. Grose, Glenville State Teachers College, Glenville, West Virginia. Mr. A. S. Margolin, West Virginia University, Morgantown, West Virginia, kindly furnished the map which accompanies this paper.

Summary

1. The paper attempts a survey of Bachman's Sparrow (*Aimophila aestivalis bachmani* Audubon) as it occurs, or has occurred, in southeastern Ohio, West Virginia, and southwestern Pennsylvania.

2. Evidence is presented to show that this species invaded the territory under consideration from the south or southwest during the latter years of the nineteenth and the early years of the twentieth centuries, the invasion reaching its northern limits, and the bird its maximum abundance from 1915 to 1922. In general, the valleys of the Ohio and Monongahela Rivers were followed in this movement. A distinct recession in numbers over a large part of the territory since 1922 is recorded.

3. Data are presented showing widespread distribution of the bird in southeastern Ohio, and in West Virginia west of the Allegheny Mountains, with a limited distribution in southwestern Pennsylvania. In West Virginia at least, the birds invaded the Transition Life Zone, and even reached the Canadian Life Zone.

4. Habitat notes show the species to be practically restricted in breeding range (in the areas under consideration) to brushy hillsides or wooded borders on fairly steep slopes.

5. The conclusion is reached that, in this territory at least, most of the nests are not domed or distinctly arched, although some nests of this type have been found. Four eggs is the usual complement, with three and five occasional. There is reason to believe that many pairs raise two broods annually.

6. The song-sequence is described, and notes on the high vocal abilities of the bird are presented.

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A PREDATOR-PREY RELATIONSHIP BETWEEN THE SHORT-EARED OWL AND THE MEADOW MOUSE

BY L. L. SNYDER AND C. E. HOPE

An influx of Short-eared Owls (*Asio flammeus*) to the Toronto region occurred in the late winter and early spring of 1936, coincident with a plague of meadow mice (*Microtus pennsylvanicus*). In reporting on this occurrence, it is pertinent to review the local status of this owl. This is made possible through the information compiled by Mr. Murray Speirs for the fifty-year period, 1887-1937, from the occurrence file in the Royal Ontario Museum of Zoology.

The Short-eared Owl has not been known to summer in the Toronto region. It is to be expected in autumn, principally during October, after which it usually disappears. It is again to be expected during February and March. Its absence during December seems fairly definite since it has been recorded only twice on the annual Christmas census of birds taken for the past thirteen years, once in 1930 and once in 1934. The species is thus a transient, which moves into the Toronto region in the autumn, passes on probably to more southerly stations and returns again for the late winter and early spring period.

There is considerable variation from year to year in the number of Short-eared Owls observed. During some years it has not been discovered. A total of thirty to sixty individuals seen during a season indicates that the species is prevalent. The first influx in such numbers occurred in the early winter of 1889-90; next in the falls of 1895 and 1896. Late winter and early spring records for 1896 and 1897 suggest a return of numbers following the fall influxes. The next period which definitely shows large numbers was not until the fall of 1909, and this was followed by a return of many birds in the early months of 1910. The last period of large numbers was in the late winter and early spring of 1936. Our records for periods between certain of those mentioned above suggest the probability that there were other years when Short-eared Owls were comparatively common, but the information is too indefinite to be useful. The most that can be said is that the species is numerous at certain periods, in the Toronto region, and at other times scarce, or entirely absent.

In February, 1936, reports of the presence of Short-eared Owls were received from several outlying sections adjacent to the city. Casual walks through one suitable habitat during the period from February 23 to March 22 led to the observation of from one to five individuals. Incidentally, it was noted that meadow mice were particularly abundant; scurrying mice and their nests were conspicuous.

Early in April another resort of this owl was discovered. Through the tell-tale signs of owl pellets, it became known that owls were, or had been, roosting in the ornamental evergreen plantings about the York Downs Golf Course in considerable numbers. This situation had not been previously regarded by local observers as a particularly likely place to find Short-eared Owls. However, during the second week of April, from one to eight individuals were noted frequenting the location. By the end of the second week they had disappeared. Roosts in the evergreens were inspected, and approximately one-half bushel of pellets, disgorged by Short-eared Owls, was picked up for examination. More than one thousand individual meals were represented by the recovered pellets. We did not attempt to explore the whole district for other roosts which may have existed. The pellets recovered gave a basis for a rough estimate of the owl population which had resorted to the scattered evergreen plantings covering perhaps eight or nine acres. Assuming that the owls had spent sixty days in this section, and had disgorged one pellet each day, the 1,078 pellets recovered gave evidence that eighteen owls had been located there. Inquiry was made of local residents and an attendant of the golf course informed us that as many as twenty-two owls had been present earlier in the year. Without doubt, there had been here an unusual concentration of Short-eared Owls during the late winter (1935-36).

Further inquiry made in the district elicited complaints from gardeners and property owners to the effect that mice had caused considerable damage to young trees and shrubs. Many young evergreens on the golf course had been girdled and a near-by nursery sustained heavy losses of stock. By motoring along the road fronting the golf course, one could see whole clumps of young trees and shrubs completely peeled of bark below the winter's snow line. Inspection of adjacent fields, uncultivated for many years except for the cutting of hay crops, disclosed that they constituted an extensive habitat for a heavy meadow mouse population. Locally there had been a veritable meadow mouse plague.

A summary of the situation is as follows: Meadow mice in the Toronto region generally, in the winter of 1935-36, were at a peak of numbers. Coincident with the large number of mice, unusual numbers of Short-eared Owls were present. The most notable concentration of owls occurred in the exact situation where meadow mice were sufficiently numerous to constitute a plague population. The relationship of the two species is revealed by the results of the pellet examinations given below.

TABLE 1. Results of Pellet Examination in 1936.

	Number	Percent
Pellets examined	1,078	
Individual animals represented	1,647	
Meadow Mice	1,181	71.7%
Deer Mice[1]	450	27.3%
House Mice	1	.1%
Birds (8 Snow Buntings, 2 English Sparrows, 1 Horned Lark, 4 unidentified)	15	.9%

During the late winter period of the next year (1937) Short-eared Owls were again present in the Toronto region but they were not as numerous as in 1936. Meadow mice were generally regarded as less numerous and damage in the locality of the golf course ceased. Studies of Short-eared Owl pellets collected during this period were undertaken, however, although such material was relatively scarce. A search was made in the same evergreen plot as the year before and a satisfactory number secured. The results for this period are as follows:

TABLE 2. Results of Pellet Examination in 1937.

	Number	Percent
Pellets examined	252	
Individual animals represented	415	
Meadow Mice	389	93.7%
Deer Mice[2]	22	5.3%
Birds (2 Snow Buntings, 1 Horned Lark, 1 unidentified)	4	1%

It will be noted from a comparison of this table with the first that the percentage of meadow mice was increased, while there was a reduction of other kinds of mice eaten. The ratio of all kinds of mice to birds taken as food remained approximately the same. It may be interpreted that the numerical ratio of Short-eared Owls to meadow mice was altered by the second year; that is, although both species were less common, there were relatively more meadow mice available to each owl present. Or it may be interpreted that a disappearance of deer mice increased the pressure on meadow mice.

The facts here presented indicate the converging of a predator on a definite area to feed on a lesser form, the population of which had attained plague proportions. The quantitative pellet analysis discloses the fact that a large number of prey animals from a restricted area were consumed. Heavy predation in 1936 occurred during late winter, a season when the reproduction of meadow mice was normally low. Thus the predator must have had a considerable effect on the numbers of mice locally.

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[1]No distinction has been made as to the forms of deer mice discovered in pellets, at least two species probably being involved.

[2]Probably of two species.

FOOD HABITS OF BUTEO HAWKS IN NORTH-CENTRAL UNITED STATES[1]

BY PAUL L. ERRINGTON AND W. J. BRECKENRIDGE

The data comprising the basis of this paper have been derived chiefly from recent studies in Iowa, Minnesota, and Wisconsin. While many stomachs have been sent in to us from various sources at different times, we have purposely avoided, except as otherwise indicated, the inclusion of data from material more than a few years old or from material not handled by ourselves personally. Our main objective has been to present a contemporary picture of the food habits of Buteo hawks in localities characteristic of north-central states environment.

We believe that stomach examinations have given us the most reliable data on the feeding habits of this genus of hawks, although we have supplemented stomach examinations whenever possible by field observations. Pellet analyses have been of some aid, but the usefulness of this technique in the study of Buteo is limited; bones of most prey animals withstand the digestive processes of these birds imperfectly if at all under ordinary conditions, and hence the pellets are not of the greatest value for quantitative work (Errington, 1932).

A particular effort has been made to distinguish between killed prey and food evidently eaten as carrion[2], but we have no way of knowing just what progress we have made in this respect. It is apparent that hawks of comparatively clumsy types, including Buteos, frequently feed on carcasses of one sort or another which they find dead in the first place. In view of the economic importance of certain species (poultry, game birds, etc.) that are known to be killed in large numbers by traffic and are well represented in the diets of some of our principal flesh-eaters, a clearer differentiation between foods eaten in connection with predation or with scavenging is much to be desired.

Aside from examination of rather complete carcasses retrieved from the possession of hawks in the field, some idea of the relative proportion of prey to carrion may be gained through careful examination of the contents of stomachs and gullets, especially of the latter in which the food is likely to be nearly in the same condition as when

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[2]We use the word "carrion" in this paper as denoting animal material which had been dead for some time before having been eaten, though not necessarily putrid.

eaten. Parenthetically, it should be pointed out, however, that the identification of a given item of food in a hawk stomach as carrion does not answer the question of whether the hawk had returned after a time to prey that had been killed or whether it had merely found a carcass acceptable as food; an investigator frequently has to weigh evidence according to probability and in the light of field experience.

In practice, we find that the portions of an animal eaten are useful in indicating whether the food represents probable prey or carrion. Gullet contents consisting of large quantities of skin, feathers, nearly meatless skeletal fragments (especially hindquarters or such bones as the sternum and synsacrum of large birds), with very little fleshy substance in the whole mass before digestion has taken place, suggest that there wasn't much left of the carcass at the time that the hawk started its meal. The presence of eggs or larvae of blow flies or sarcophagous insects of similar habits may be significant. Killed prey may often be suggested by heads and other parts of a victim usually eaten first by specific raptors, by solid masses of flesh (such as the upper breast meat of medium-sized birds), or by material comparatively free from dirt but mixed with particles of clean, incidentally ingested vegetation.

Red-tailed Hawk—*Buteo borealis*

Data from the wooded and hilly dairy and agricultural lands of south-central Wisconsin.

The following generalization by Errington (1933a) is based upon the examination of 105 items of fresh prey retrieved from nests or from field feeding places, 7 gullet-contents of juvenals, 15 stomachs of adults, and 17 pellets of superior quality.

"A composite of the redtail's food habits might be compiled from the 165 individuals of prey tabulated as quantitative data: cottontail (*Sylvilagus*) [including 8 or more juvenals], 18; arboreal squirrel (mainly *Sciurus niger rufiventer*), 11; Franklin's ground squirrel (*Citellus franklini*), 3; striped ground squirrel (*Citellus tridecemlineatus*), 49; chipmunk (*Tamias*), 3; Norway rat (*Rattus norvegicus*), 1; meadow mouse (*Microtus*), 42; deer mouse (*Peromyscus*), 4; house mouse (*Mus*), 1; weasel (*Mustela*), 1; shrew (5 *Blarina*, 1 *Sorex*), 6; young horned lark (*Otocoris*), 1; domestic pigeon (young?), 1; domestic chicken (all young but 2), 18; gallinule (*Gallinula*), 1; snake (1 *Heterodon*, 1 *Pituophis*, 2 *Thamnophis*), 4; frog (*Rana*), 1."

Errington goes on to conclude that the amount of damage redtails may do to barnyard flocks "varies with the individual hawk and with the degree of exposure of the fowls and their ability to look out

for themselves. Old redtails that distrust man keep away from habitations where most poultry is congregated; these wary ones rarely get chickens except a few that wander far out in coverless fields. Juvenals, awkward hunters, seem to be the boldest raiders, but adults unusually tempted may lose some of their caution."

In the latter connection, and having a bearing on the popular supposition that hawks "once chicken killers, always chicken killers", we may again quote relative to studies of a redtail nest (Errington 1933a): "I was unable to obtain many real quantitative data . . . but judging by the masses of feathers always in sight and by the pellets from the youngsters, I feel safe in stating that this family of redtails lived almost exclusively upon young domestic chickens from the last of April to the forepart of June. From June 8 to about June 20, the diet was cottontail and ground squirrel, with some chicken. From the last third of June to July 9, the pellets of the tethered[3] juvenal showed little except cottontail, ground squirrel and mouse." In another nest (also with tethered young), observed from May to July, chickens occurred most prominently from May 21 to June 5, sparingly both before and after these dates.

From the evidence, it then appears that the redtail's depredations upon domestic chickens are more a matter of convenience of access at times when and in places where the chickens are most vulnerable as prey. We suspect that preference plays a minimal rôle in governing the food habits of any of the Buteos, though plainly the hunting habits of individual birds may be modified by experience. Indeed, the readiness of the redtail to turn to the fresher grades of carrion when that is easier to get than live prey leads us to question that this hawk cares especially what it eats as long as the food is acceptable and may be secured with apparent safety.

Additional Wisconsin data on the feeding of the redtail represent mainly those recorded from winter field observations: carrion pig, 1; cottontail (including one that was carrion), 3; meadow mouse, 5; striped ground squirrel, 1; carrion domestic chicken, 1; cock ringnecked pheasant (*Phasianus colchicus torquatus*), 1; starving bobwhite (*Colinus virginianus*—see Errington, 1933b), 2. One stomach contained carrion domestic chicken.

A number of probable redtail winter pellets were picked up at random in the field but not systematically examined; these usually consisted of cottontail and mouse fur, and frequently of domestic

[3]Fastened for study on the ground near the nest; for discussion of technique of tethering see Errington, 1932.

chicken feathers. Domestic chickens eaten at this season largely represented carrion, of which an abundance was made available to redtails and other scavenging predators through the farm practice of scattering carcasses of many sorts over the fields with manure. One pellet was noted to contain remains of a mole (*Scalopus*), and another, remains of a small mink (*Mustela vison*).

By way of comparing the redtail's food habits in south-central Wisconsin with the food habits of this species in southern Michigan, we may quote English (1934) on the prey brought to a nest he had under observation: "The following specimens of vertebrate prey were brought into the nest by the adults during a period of seventy-four days, between May 2 and July 15: Avian prey: Pheasants, 7; Hungarian partridge, 3; quail, 2; flickers, 3; starlings, 2; and sparrows, 2. Mammalian prey: moles, 7; Microtus, 7; cottontail (juvenile), 5; weasels, 5; fox squirrel, 5; red squirrel, 1; and spermophile, 1. One milk snake was also brought in. Some of the smaller animals, especially *Microtus*, were eaten immediately and left no trace. For this reason they could not be recorded from remains found in the nest. Pellet analyses disclosed, however, that many animals were eaten which were not observed as fresh prey. On the basis of the ninety-four pellets analyzed, *Microtus* runs up to sixty-two and small birds to fifteen."

Data largely from the open farming country of "Corn Belt" Iowa.

Nine stomachs, principally the contributions of Mr. Walter Thietje, of the University of Iowa Museum, for the fall and winter of 1933-34, contained cottontail in 4; meadow mouse (total of 3) in 2; Franklin's ground squirrel in 1; domestic chicken, 3; goose (?), 1; garter snake (*Thamnophis*), 1. Of these items, all three of the domestic chicken representations were judged to be carrion; likewise, the Franklin's ground squirrel and one of the cottontails. A considerable quantity of grasshoppers (*Melanoplus*) was found in one stomach, and another hawk had eaten nothing but crickets (*Gryllus*).

Food items noted in the course of field observations: cottontail, 3; *Microtus*, 1; *Peromyscus*, 2; unidentified mice, 2; Franklin's ground squirrel, 1; young domestic chicken, 1; ring-necked pheasant (a young cock and a carrion hen), 2; traffic-killed Hungarian partridge (*Perdix perdix*), 1; bob-white (including one bird weak from an undetermined cause), 2.

Thirty-two pellets were examined between the fall of 1933 and the spring of 1936. Twenty were predominantly of cottontail; 11 of mice, representing a total of about 55 *Microtus* and *Peromyscus* in approximately equal proportions; one, domestic chicken.

Data largely from the prairie agricultural lands of southern Minnesota and eastern South Dakota.

Forty-four stomachs of various races of redtails were examined, from hawks sent in to Breckenridge by individual cöoperators during the fall and spring of 1932-33. Five of these were empty.

Representation of food items: carrion hog (?) in one stomach; cottontail (judged to be carrion in three instances), 8; juvenile Leporidae, probably cottontail, 2; meadow mouse, 7; deer mouse, 3; harvest mouse (*Reithrodontomys*), 1; pocket gopher (*Geomys*), 1; Franklin's ground squirrel, 2; striped ground squirrel, 4; short-tailed shrew (*Blarina*), 2; domestic chicken (judged to be carrion in three instances), 4; ring-necked pheasant (including 4 young and 4 apparently carrion), 12; song sparrow (*Melospiza*), 1; mourning dove (*Zenaidura*), 1; toad (*Bufo*), 5; frog (*Rana clamitans*), 1; salamander (*Ambystoma*), 1. Two stomachs contained small amounts of unidentified feathers; and one held a mass of badly disintegrated unidentified feathers, probably carrion.

Insects were represented in ten stomachs, of which one stomach was gorged with grasshoppers. The chief insects eaten were grasshoppers and crickets, with one *Calosoma* and some other Coleoptera, and one moth.

Twenty of this lot of stomachs are recorded as from adult hawks and twenty-one from juvenals. The carrion feeding propensities of adults and juvenals did not seem to differ significantly, as the stomachs of three adults and four juvenals revealed material considered to be mainly carrion. Four of the five empty stomachs were juvenals, however, as well as the one stomach filled with grasshoppers.

As Breckenridge (1935) has pointed out, the unusually heavy representation of ring-necked pheasants in stomachs of redtails, rough-legs and other hawks shot in western Minnesota during the fall migration may at least in part be explainable in terms other than those of direct predation. Due to the large numbers of young and inexperienced pheasants normally to be found in the fall in good pheasant country, the high traffic toll upon them at this time makes pheasant carrion an especially available source of food for the migrants. The fall hawk flights, moreover, seem to be concentrated in this area, and pheasants lost or crippled in connection with the hunting season (for a discussion of crippling losses of game birds, see Errington and Bennett, 1933) are doubtless acceptable also to about whatever hungry predators are able to find or to capture them, including raptors of clumsy types.

RED-SHOULDERED HAWK—*Buteo lineatus*

Data from the densely wooded Wisconsin River Bottomlands of south-central Wisconsin.

"May, 1930, gullet contents of nestlings: snake (probably *Thamnophis*), 1; frog (*Rana*), 1. Fresh prey in nest: meadow mouse, 1. Nest litter contained feathers of a red-winged blackbird (*Agelaius*), considerable quantities of pellet mouse fur, snake scales, and crayfish (*Cambarus*) exoskeleton fragments." (Errington, 1933a).

The Red-shouldered Hawk is fairly common in Iowa, but we find that we have practically no data enabling us to make an original contribution on its food habits. The general impression we have gained from field experience is that its food habits do not differ so very much from those of the Broad-winged Hawk, except that it may exert a little more pressure upon small mammals.

BROAD-WINGED HAWK—*Buteo platypterus*

Data from a lake-side tract of almost virgin woodland in south-central Wisconsin.

"July, 1929, material from one nest: chipmunk, 1; meadow mouse, 1; shrew (*Blarina*), 4; red-winged blackbird, 1; garter snake, 1; unknown quantities of insects (largely *Phyllophaga* and other Coleoptera)." (Errington, 1933a).

Data mainly from the partly wooded portions of eastern Iowa and southern Minnesota.

The seventeen stomachs examined were chiefly those sent to Errington by Thietje and to Breckenridge by Minnesota cöoperators. Most of the hawks were taken either in May, 1933, or in September, 1934.

Except for one stomach which was empty, all but one of this collection contained few to many insects, these comprising the principal contents of eight stomachs and being well represented in five more. Five hawks had swallowed large quantities of mud and three much plant material, apparently in connection with their feeding on animals inhabiting low, wet places. In one instance, the mud and vegetation were mixed and the mass had the general aspect of sod; the associated prey animals were two Carabid larvae and an earthworm.

Vertebrates listed in the analyses: cottontail (including carrion adult and one very young individual), 3; carrion striped ground squirrel, 1; small snake (*Storeria*), 2; unidentified snake, 1; toad (*Bufo*), 5; frog (*Rana*), 4.

Insects listed include wood ants (*Formicidae*), 8; May beetle (*Phyllophaga*) larva, 1; *Geotrupes*, 2; *Canthon*, 6; click beetle (Elateridae) larva, 1; ground beetle (*Harpalus*), 2; unidentified Carabid larvae, 12; Coleoptera debris, unknown number of genera and individuals. One stomach contained a mass of Diptera larvae and Lepidoptera larvae mixed. Of ten individuals of Lepidoptera larvae distinguished in other stomachs, five were Noctuids (cutworms and armyworms). Orthoptera were most heavily represented, the records showing counts of 113 grasshoppers (*Melanoplus*), 3 meadow grasshoppers (*Conocephalus*), and 1 cricket (*Gryllus*). Other invertebrates were a spider (Arachnida) and the previously mentioned earthworm (*Lumbricus*).

SWAINSON'S HAWK—*Buteo swainsoni*

Data from western Minnesota.

Two of three fall stomachs (one was empty) sent in to Breckenridge by cöoperators contained nothing except insect material, almost wholly Orthoptera, with one beetle and one Noctuid larva.

Data from the vicinity of a nest in the timber of a dry creek. Haakon County, western South Dakota.

On August 23, 1934, Errington found one grown juvenal still staying about the nest, and collected seventeen fresh and recent pellets. The nest debris was of Leporidae, meadowlark, and snake remains, with a scattering of insect fragments.

Representation of prey: juvenile Leporidae (including 3 questionably identified as young jack rabbits and 2 as young cottontails), in 6 pellets; deer mouse, 1; prairie dog (*Cynomys*, including at least 1 young), 11; meadow lark (*Sturnella*, including traces in 2 pellets), 8; unidentified small birds (probably Fringillidae), 4; snakes (including only traces in 7 pellets), 16; insect remains (usually present in comparatively small quantities) in 16. A certain amount of vegetation was found, especially burdock (*Arctium*) seeds which we suspected of having been the stomach contents of the meadowlarks.

The high representation of both prairie dogs and meadowlarks is surprising to us, but the terrific drought season of 1934 may have in some way rendered these species unusually available. The snake identifications, made by Mrs. F. N. Hamerstrom, Jr. and the late Professor J. E. Guthrie for thirteen of the pellets, indicate that garter snakes (*Thamnophis*) and blue racers (*Coluber*) were eaten in about equal proportions.

We were surprised, too, by the rather incidental representation of insects in the pellets, even after the young had doubtless been hunting

"on their own" for some time. Those insects eaten were mainly *Melanoplus* and Carabid beetles , of which *Chlaenius* and *Harpalus* were identified. Grasshoppers were sufficiently abundant so that one would have expected them to have been taken in greater numbers; Errington has frequently observed the Swainson's Hawk in this region feeding in the manner described by Taverner (1926, p. 196): "It varies its rodent food with grasshoppers it catches on the ground with clumsy gravity, making heavy hops with waving wings and short runs hither and thither as it grabs the nimble insects with talons that look absurdly big and formidable for the purpose."

AMERICAN ROUGH-LEGGED HAWK—*Buteo lagopus sancti-johannis*

Data from wooded, hilly agricultural lands of south-central Wisconsin.

"Falls of 1929 and 1930, stomach contents of 5 Rough-legged Hawks shot by hunters and farmers: meadow mouse, 8; shrew (*Sorex*), 1; a few insects, mainly crickets (*Gryllus*)." (Errington, 1933a).

Data predominantly from prairie farming country of central Iowa, southern Minnesota, and eastern South Dakota.

The twenty-three stomachs examined were mostly sent in to Breckenridge by Minnesota and South Dakota cöoperators during the fall, winter, and spring of 1932-33.

Items listed: Carrion jack rabbit (*Lepus*), 1; cottontail (at least two of which were known to be carrion), 8; juvenile Leporidae (probably cottontail), 3; *Mus* (all in one stomach), 5; *Microtus*, 42; *Peromyscus*, 8; unidentified mice, 2; Franklin's ground squirrel, 1; striped ground squirrel, 2; domestic chicken (including one carrion and one young), 3; ring-necked pheasant (including two young individuals and three evidently carrion), 7; unidentified small bird, 1. One stomach contained remains of a grasshopper and two others small quantities of crickets.

A comparison of the stomach contents of redtails and roughlegs would indicate a decided similarity in their food habits, but our field observations on the two species suggest some distinct differences. The Rough-legged Hawk, while larger in appearance, is in our opinion actually much less formidable as a predator than the redtail. The roughleg has impressed us as being slower and weaker than the redtail and even more prone to feed upon carrion. We have noted the former hawk picking away at the remains of traffic victims along highways, as well as at miscellaneous carcasses in fields, and to this extent its food habits correspond to those of the redtail. We have few observa-

tions, however, which lead us to think that the roughleg is often disposed to attack prey of a size greatly exceeding that of a ground squirrel or a young cottontail. It is to be suspected that the poultry and pheasant remains in the stomachs may represent mainly carrion feeding, with the possible exception of the more immature individuals eaten.

Concluding Remarks

As a genus, the Buteos are stocky and rather clumsy hawks, varying in size, strength, and habitat. They may be frequently seen soaring over woods and fields and show a partiality for such perching places as the tops of dead trees, telephone poles, and fence posts. With respect to temperament and intelligence, there is considerable variation with the species, the redtail in our estimation being the most spirited, the most tameable, and the most generally adaptable.

We have little reason to believe that preference for some type of prey influences the food habits of the species herein discussed to any conspicuous extent, although the "education" of each individual bird and its resulting routine of hunting undoubtedly does. What a redtail or any other Buteo eats is largely a matter of what is to be had without too much trouble; what is conspicuous enough to be readily seen by a hungry bird; what is within the bird's power to capture and to handle; or what is already available in the form of a carcass beside a highway, along a lake shore, or in a field or a woodlot. The feeding of all midwest Buteos upon rodents, snakes, invertebrates, and whatever else they may recognize as eligible food and can readily get claws on, reveals a conforming to ecological pattern that combines, as well as is controlled by, the elements of naturalness and necessity.

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NEST LIFE OF THE BANK SWALLOW

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The Bank Swallow (*Riparia riparia* (Linnaeus)) is the smallest of our six species of swallows in eastern North America, and while not as brilliantly colored as most of the others it is in some ways the most interesting, particularly in its habit of nesting in colonies, sometimes of hundreds of pairs, in sand and gravel banks. Intrigued by the grace and charm of this bird, and by its cleverness in excavating a nest burrow far into the vertical sides of a hard bank, I determined to make it the object of a detailed study as a part of my graduate work in ornithology at Cornell University.

In June of 1932 I located three small colonies of Bank Swallows nesting in sand banks near Milton, Northumberland County, Pennsylvania. These banks were being worked on a small scale for commercial purposes. I was told by residents of this section that years before, when the sand bank owners were prospering and shipping out sand by the carload, Bank Swallows nested there by the hundreds. The sand at this place is coarse in texture and rather loosely packed, and the weather, in a few months after the operators ceased working at a given point, would wear down the vertical faces of the banks to a slope unsuited to the nesting of the swallows. Consequently the Bank Swallow population of this section was directly dependent on the amount of commercial activity in the sand banks. Of course many nests were destroyed by the sand diggers, but the nesting sites made available by their activities seemed to more than compensate for this destruction.

From a blind placed only a few feet in front of the entrances I observed burrow excavating and nest building. Both birds of a pair took part in the work. A bird would begin by clinging to the vertical face of the bank with feet and tail and pecking at the dirt with a side-to-side motion of the head. When the opening was deep enough for it to get partly inside it would use its feet also, kicking the loosened sand backward in vigorous little spurts. As the tunnel became deeper the bird disappeared from sight, but still the sand came spurting out as evidence of the work of the little miner inside.

Bank Swallows seem to take the work of excavating their burrows very lightly, more like play than work. Indeed, an eager holiday spirit seems to pervade the flock. A swallow will work vigorously for a few minutes, the while many of its comrades are circling about over the bank talking to each other in their reedy, buzzing twitter. Soon it

can no longer resist the temptation and it flies out for a ride through the air with them. But usually not for long, and after a few minutes it returns to its job. These activities continue throughout the day, though at intervals the entire flock may leave the bank for a time. As evening comes on they fly away to some favorite roosting place in a nearby marsh.

In the early stages of burrow excavation some fighting occurs among the occupants of a nesting site, apparently in settling territorial claims to desirable burrow locations. The contestants peck each other vigorously and sometimes fall together to the earth in front of the bank in the intensity of their struggles. Soon one succeeds in demonstrating its mastery over the other and the defeated bird flies away, though no apparent damage has been done to either.

After a few days of these activities some of the birds begin to carry straws and grasses into their burrows. At this stage, when just completed, the burrow is about 2½ inches wide by 1½ inches high, somewhat flattish across the top and more rounded below. As the burrows become older, however, they lose this form, especially about the entrance, because of wearing due to use by the birds and by erosion, so that the opening tends to become larger and rather rounded, particularly in such loosely packed sand as that in the sand banks near Milton. The depth of the burrows here averaged about thirty inches, though some were much deeper and one reached forty-three inches. Usually the burrow slopes slightly upward or bends gently upward a few inches back from the entrance. This is a decided advantage in that it prevents rain water, during heavy storms, from running into the burrows and flooding the nests. However, I have found a number which had no perceptible upward slope or bend.

The straws and grasses are used for the body of the nest, which is placed in an enlargement at the inner end of the burrow. Later the birds carry in feathers to be used as a soft lining for the nest. The feathers are almost always white ones, though occasionally one finds dark ones such as those of Barred Plymouth Rock fowls, or blue pigeon feathers.

One wonders where the birds get all the feathers. They seem to have no trouble finding them, for in addition to all they use in the nests one finds many scattered around on the ground in the vicinity of the nesting site. They seem to enjoy playing with them. One day in early June I saw a white feather floating high in the air just above a bank where a large colony of Bank Swallows was located. Suddenly a swallow darted at tthe feather, caught it and carried it a short dis-

tance, and then released it. Another bird caught the feather and released it, and then another and another. At last, apparently tiring of the game, one caught the feather and carried it into its burrow. Many of their activities during the early part of the nesting season seem to be carried on for the pure fun of it. They seem to like to poise on beating wings before the face of the bank where their nests are located, holding their positions for a few seconds and then wheeling away out over the nearby fields, only to return soon again to repeat the performance. This they do in companies of eight to a dozen or more.

One of my purposes was to observe the nest life of the Bank Swallow at close range. Because their nests are placed so deeply in sand or gravel banks this was much more difficult to accomplish than it would have been with almost any other kind of bird. However, I believed it would be possible to dig a pit down from the top of the bank to some distance below the level of the nests, work carefully forward until one came to the nests from the rear, and then make a small opening into the nest cavity through which to make observations. Accordingly, after waiting several days to allow time for eggs to be laid and incubation to get under way, I began a pit some four feet back from the edge of the bank. The burrows were scattered irregularly over the face, some being not much more than a foot from the top while others were six or seven feet down. When I reached a depth of several feet I began to work carefully forward toward the nests, using a trowel. The sand was of uniform texture throughout, with no roots except those of grasses and dewberry plants near the surface, making the digging a rather easy job.

The first nest I came to had five pure white eggs, but the next one had recently hatched young. I plugged the openings into both nests with rags, hurriedly arranged a covering over the opening of the pit above so as to darken it, with myself inside, and sat down in the earthly darkness to await developments. The birds had been more or less disturbed by my digging operations, but now that all was quiet again they soon returned and I could hear their twittering outside. Before long I heard twittering in the nest that contained young, only a few inches away beyond the rag plug. Carefully pulling the rag so as to make a tiny opening I cautiously looked in, and there in the semi-darkness saw the parent bird brooding the young. What a thrill to be so near!

It was very difficult to avoid disturbing the parent bird and several times it left the nest hurriedly, though it always returned before long. Sometimes it brought food for the young, so that I was able to observe

FIG. 20. Adult Bank Swallows at the entrances of their burrows.

FIG. 21. Nest and eggs of the Bank Swallow, as opened, showing the entrance burrow leading off to the right.

both brooding and feeding this first day. Fearing that too prolonged observation at this stage might cause the old birds to desert I decided to go home and leave them until the next day to become accustomed to the new arrangements. I closed the rear opening into the nest cavity with a square of old linoleum held in place with sharp sticks pushed into the sand, and after crawling out of the pit covered it with a big piece of old linoleum. Before leaving the place I had to build a rude fence around the pit to prevent certain cows, which were pasturing in the field and which had been showing altogether too warm an interest in my investigations, from falling into it.

I returned to the sand bank on the afternoon of the following day with great anticipations, but to my keen disappointment found the nests deserted. Apparently my extensive mining operations disturbed the birds too much. Perhaps tiny drafts of air blowing through their burrows and over the nests, which I was not able entirely to prevent after they were opened from behind, caused the desertion. At any rate my hopes of studying the nest life of the Bank Swallow this season were not to be realized, and it was not until two years later that I succeeded in observing it from hatching time until the young left the nest.

The summer of 1934 I spent at Sodus Bay on the southern shore of Lake Ontario, where Bank Swallows nested by the thousands in the high bluffs that face the lake. The soil here is much harder for the birds to dig than the sand banks at Milton, being a tightly packed boulder clay of glacial origin with many pebbles and larger stones scattered through it, and as a result the nest burrows are not nearly so deep as those in the easily worked sand at Milton. I measured many burrows and found them to range from fourteen inches to eighteen and one-half inches in depth. Some were placed only a few inches from the top of the bluff in the humus-bearing soil to be found there, while many others were to be found farther down the face of the bluff. Not nearly all the burrows were occupied, since many of them had to be abandoned because the birds had met rocks or roots before the burrows were deep enough, making it necessary for them to start over again in a new place. Occasionally, however, they would detour around the obstruction by bending the burrow to one side.

After a little search I found a place favorable for my mining operations. A pit was dug a short distance back from the edge of the bluff, deep enough that it would be possible to sit in it for several hours with a fair degree of comfort while making observations. This time I planned to fill the pit with soil up to a point above the level

of the nests after each observation, to prevent tthe possibility of drafts blowing through the burrows. As the nests here were only a few inches below the top of the bluff it was not necessary to make the pit very deep, so that the labor of shoveling the dirt out of the pit and in again each day was not prohibitive.

On the day, June 23, when the excavation was made into the two nests included in the pit, there were two-day old nestlings in the nest on the left and newly-hatched young in the nest on the right. The new openings into both nest cavities were plugged with rags to prevent drafts from blowing over the young birds and also to give the old birds time to become accustomed to the changes in the rear of the nest cavities. Then I covered the pit, myself inside, with two thicknesses of tent canvas and sat down to await the birds' pleasure. In less than half an hour I heard the low-pitched reedy twittering of an adult Bank Swallow in the nest on the right—the one with newly-hatched young. With extreme care I pulled the rags slightly to one side, making a little opening through which I could see one of the old birds brooding the young. Later I enlarged the opening until it was more than an inch across. This startled the bird and it flew out, but soon returned. Occasionally both parent birds were in the nest cavity together. They seemed greatly mystified and somewhat disturbed by the strange developments at the rear of their nest cavity and several times one of them came to the opening and put its head through, peering inquiringly into my partially darkened pit. These two nests were only a little more than a foot in from the face of the bank and this short distance allowed a good deal of light to penetrate into the pit through the burrow and nest cavity. Once or twice I had to put my hand to the opening to keep one of the birds from falling into the pit with me.

The newly-hatched birds in this nest were pink in color, with a scanty covering of gray down on the back of the head and neck, base of wings, and top of back. The eyes were very large and showed black through the closed lids. The inside of the mouth and the flanges on the bill were lemon-yellow, the bill yellowish-gray, the feet pinkish-gray. The tiny nestlings appeared quite weak and it seemed to be only with the greatest effort that they were able to raise their immense wobbly heads for the food their parents brought them.

The old birds did not return to the nest on the left, in which the young were two days old, until after an hour or more. Before leaving for the day I plugged both openings tightly with rags and shoveled the removed dirt back into the pit.

When I returned the next day I put a glass window in the opening to the nest on the right, holding it in place by means of sharpened hooked sticks which I pushed firmly into the soil. The opening into the nest cavity through the glass was now an irregular one about three inches deep by four inches wide which allowed a clear view of all that went on in the nest cavity from within the pit. When the old birds returned to the nest they seemed much puzzled by the shiny glass at the back of the nest cavity. They came back to it, one at a time, and pecked at it, no doubt disturbed by the reflections of themselves which they must have seen in the glass against the dark interior of the pit. But after a short time they accepted this new arrangement and went about their duties of feeding and caring for their young, though returning now and again to peer wonderingly into the glass and peck at it.

During the hour which I spent in the observation pit the young were fed several times on small flies, the parent placing the food far down into the mouths of the nestlings. One of the parent birds remained on the nest nearly all the time, brooding the young while the other was foraging for food. When the latter one returned to the burrow, giving its low cheerful twitter upon reaching the entrance, the bird that had been brooding flew out for a short time, usually returning before the one that had brought food was gone. Judging from their actions and from the fact that the bird that brought in the food was somewhat more active and more alert and masculine in appearance than the one that did most of the brooding I believe it safe to call it the male, and the one that brooded the young most the female. Later observations tended to uphold this view, though not to prove it conclusively. Male and female Bank Swallows look so much alike that it is impossible to tell them apart with certainty without killing and dissecting them.

It was necessary for me to be away from Sodus Bay for the next two days, but Mr. William Montagna, then a student at Bethany College and a keen bird man who was helping me during the summer's study, spent a part of each day in the observation pit. He found the nest on the left deserted, but everything was all right in the one on the right, where I had placed the glass window the day before. As happened then one bird, apparently the female, remained on the nest most of the time to brood the young while the other, apparently the male, foraged for food. When he returned she usually left the burrow for a moment, coming back about the time he had finished feeding the young. Sometimes she would remain outside longer and then the male

would brood the young until her return. When returning from these short trips outside the female sometimes brought food also.

Sometimes while the female was brooding the young the male would squeeze himself in beside her on the nest and then actually push her off. She would leave reluctantly and return in a few seconds. Sometimes while the male was foraging he would come back to the entrance of the burrow, twittering cheerfully, look in for a second or two as if to see that everything was all right, then fly away.

When entering the burrow with food the male calls in a series of peculiarly sweet, fine notes much higher in pitch than the usual Bank Swallow call. This seems to be the food call to the young, for upon hearing it they raise their heads with mouths wide open. That is, if they are hungry. At times they do not seem to be hungry and give no response to the call. Then the male does a most surprising thing—he lightly tramps over them, gently kicking them as though to awaken them out of their sleepiness, calling sweetly all the while. Soon one or another raises its wobbly head, opens its mouth, and the food is deposited within.

On the next day, the fourth for our observations, feeding went on just as it had the day before, the male foraging while the female remained in the nest to brood the three young. Feeding occurred on an average of twice every five minutes, the diet consisting mostly of small flies and caddice flies. The parent birds, on this as well as the previous days, swallowed the small packets of excrement voided by the nestlings. Sometimes the female, after inspecting and cleaning the nest, would walk forward from it some distance in the burrow and then back up over it, spreading her feathers over the young to brood them.

On the fifth day, which was really the day when the young were four days old, I heard for the first time the call notes of the nestlings, weak and rather frequent and resembling somewhat the food call of the old birds. As on previous days, the male did nearly all the feeding, the female bringing food only three or four times during a two-hour period. The food was of the same character as that of the day before, mostly of flies and caddice flies, which often protruded from the old bird's mouth when it entered the burrow. The parent gave all the food brought on a single trip to but one offspring, not dividing the load among two or more as do many small birds. Only for short periods were both parents absent from the nest, seldom for more than a minute at a time. As before, the male brooded the young for short periods while the female was out of the burrow, and he, while brood-

ing, nearly always sat facing out. The female while brooding often faced in.

As the days passed the character of the food brought to the young gradually changed, probably due mainly to changes in the relative abundance of various kinds of insects in the vicinity. On the sixth day a brood of may-flies emerged along the lake shore and these insects began to appear in the diet. The young birds, now five day old, required less brooding, for on several occasions both parents were absent from the nest. At this age the feather sheaths have appeared in the feather tracts but as yet none of them have burst. The nestlings are much more stronger and noticeably larger, and their eyes are open though they keep them closed most of the time. Sometimes both parent birds returned to the nest at the same time, each carrying food. On one trip one of them brought a white feather and spent some time working it into the texture of the nest.

Each day the young birds were becoming more active, and their appetites larger. Their parents no longer needed to resort to the old trick of tramping over them to arouse them to take food. On the day they were six days old their food consisted mostly of may-flies. Both old birds were out of the burrow during most of the observation period, brooding the young for only two or three very short periods during the hour and ten minutes which I spent in the pit. They fed the young frequently for a while and then not so often, sometimes not more than once in ten minutes. Again one of the parents brought a white feather which it added to those in the nest, working it carefully in and rearranging the others. They no longer swallowed all the excrement of the young, but carried much of it outside the burrow.

On June 30, when the nestlings were seven days old, I spent from 7:05 A. M. to 9:45 A. M. in the observation pit, a period of two hours and forty minutes. Neither of the old birds returned until 8:15 A. M., leaving the nestlings alone for an hour and ten minutes. I was beginning to fear they had deserted, but after they did return they came regularly, feeding the young ten times in an hour. At no time were both birds in the burrow at the same time. Brooding had become less needful each day as the young grew older, and on this day what little brooding was done was for very short periods only, usually for less than a minute. The female, relieved of the necessity of remaining so much in the burrow to brood, took a more active part in the feeding operations. The food seemed to be exclusively may-flies on this day. The parent birds no longer swallowed any of the excrement of the young, but carried it away from the burrow each time. At this age of

the young many feathers in the dorsal tract have burst their sheaths, and also a few of the wing and tail feathers.

The following day I spent an hour and a half in the observation pit. Feeding occurred twelve times during the first hour, but after that neither of the old birds returned. In fact the parents leave their young alone for more or less extended periods during this stage of their development, as we saw by their absence for an hour and ten minutes on the day before. The young birds have become increasingly active each day. On this day they moved quite freely about the nest cavity, especially to void excrement. In performing this act they nearly always moved forward toward the entrance of the burrow, though occasionally one of them would come to the back of the nest cavity and leave the capsule of waste matter against the glass of the window. As during the day before all excrement was carried out of the burrow by the old birds, none of it swallowed. The young birds usually answered the calls of their parents given as the latter came through the entrance. Their voices had now begun to resemble those of adult Bank Swallows. Sometimes when they did not respond to the food call of the parent the old bird gave a very soft, high-pitched call that was exceedingly musical and sweet.

During the observation period on the next day the old birds were away most of the time, feeding the young only once in the space of an hour. The nestlings were very hungry and at the appearance of one of the parents at the entrance with food rushed toward it down the burrow with mouths widely open. Now nine days old, they had become rather well feathered, most of the body feathers and many of the wing and tail feathers having burst their sheaths. However, their appearance was rough and unkempt, for the feathers were only partly grown and the scanty natal down still clung to the tips of many of the feathers.

On July 3 the young, then ten days old, were very active and hungry, stretching their necks, opening their mouths, and calling eagerly for food when an old bird appeared at the entrance. They were fed thirteen times in an hour, the food being practically all mayflies. They moved freely about in the nest cavity, one or two of them frequently getting outside the nest proper and pressing against the dirt wall of the cavity or the glass window at the back. At other times all three young birds lay quietly in the nest for a time, later to resume their restless movements. Fleas (*Cerathophyllus riparius* J. and R.), which breed abundantly in the nest material, seemed to cause them some annoyance, for the pests were often seen crawling about

over the birds. Mites also infested them, and their frequent scratching and picking at themselves were doubtless caused by the attacks of these parasites.

On the next day I observed activities in the nest from 9:40 A. M. to 11:50 A. M. The old birds did not return until 10:26, but after that they came very often, thirteen times in half an hour. The young were exceedingly active, especially when food was brought. The parents did not brood them at all any more. I exploded several photoflash bulbs in an attempt to secure flashlight pictures and neither the old birds nor the young seemed to be disturbed by the sudden brilliant flash of light. But when I removed two of the nestlings, leaving only one in the nest, the old bird was much puzzled and looked anxiously about the cavity for the missing young. I soon returned them to the nest and then the parents seemed satisfied again.

No visits were made to the nest on July 5, but the entire day of July 6, from 5:00 A. M. until 8:00 P. M., was spent in the observation pit. Thus far the daily observations had been for periods ranging from an hour to nearly three hours, sometimes in the forenoon and sometimes in the afternoon. It seemed that an entire day, from dawn to dark, spent in observation of the nest activities might give an insight into the daily life of the birds that we were missing in our shorter daily periods. We decided to work in two-hour shifts, I to take the first one from 5:00 A. M. to 7:00 A. M., Mr. Montagna the second, from 7:00 A. M. to 9:00 A. M., I the third, he the fourth, and so on. As it happened, we chose what turned out to be the hottest, most oppressive day of the entire summer for our day-long vigil, a day of great humidity and intermittent thunder showers, with periods of warm sunshine between the showers. The conditions on such a day within the narrow confines of the observation pit, covered over by two thicknesses of canvas, can hardly be imagined. I learned that day what it means to sweat from every pore.

It was raining slightly from a nearby thunderstorm when we arrived at the bluff where the observation pit was located at 4:25 A. M. No swallows were flying about as yet. But it was necessary for us to return to camp for some forgotten equipment and when we came back at 4:45 A. M. many of the birds were coursing about above the bluff and over the lake. We opened the pit and found only two young birds in the nest. Later search at the foot of the bank in front of the burrow disclosed the fate of the missing one—it had fallen out of the entrance of the burrow and been dashed to its death on the hard soil below. Young Bank Swallows of this age often rush toward the en-

trance to meet one of their parents returning with food, and it was probably in this way that the accident occurred.

The remaining nestlings were thirteen days old on this day. They were quite well feathered, with a considerable amount of natal down still clinging to them. They spent a good part of the time moving about, exercising by stretching wings and legs, and preening their feathers. At other times they rested sitting in the nest, or leaning against the dirt wall of the nest cavity or the glass of the window. Sometimes one of them would press itself hard into the corner formed where the glass of the window met the earth of the cavity wall. At other times they would lean against each other, eyes shut and heads drooping in the most comical fashion. The day was very warm, causing them to pant from the heat.

But when the call of one of the old birds was heard at the entrance both nestlings became eagerly alive, often rushing forward to meet the parent for the food. They were nearly always fed alternately. This was not due to any choice on the part of the parents, but to the habit of the young bird just fed retiring to the back of the burrow and the other moving forward to be in the most advantageous position when next a parent returned with food. Once in a while this method of alternating did not work, mainly, I think, because the young bird whose turn it was to be fed next was not hungry enough to move forward where it would be the first to meet the returning parent.

During the fifteen hours that the nest was under continual observation food was brought one hundred and fifteen times. Except for several fairly long absences from the nest of eleven to fifty-five minutes occasioned by outside disturbances such as our changing watch at the end of each two-hour interval, the arrival of campers at their tent nearby, and their engaging in target practice, the length of time between feedings ranged from one to fifteen minutes, averaging somewhat less than five minutes for the day. Several times both parents came at the same time with food. May-flies again seemed to be the main article of diet. Occasionally one would be dropped while being passed from parent to young and it would struggle, in a more or less mutilated condition, along the floor of the burrow toward the entrance. Neither the young nor old birds would pay any attention to it.

During the period from 5:00 P. M. to 7:00 P. M. feeding occurred more often, many times at only one-minute intervals. But after 7:00 P. M. no more visits were made by the parents that day.

Twice during the day a grass stem was brought and added to the nest, and once a feather. Excrement was removed whenever voided by the young, each time by carrying to the outside.

Outside the pit it was noticed that at about 7:30 P. M. a general movement of the swallows flying about began down along the shore of the lake toward the marshes on Sodus Bay. They did not all leave at once, but the number diminished gradually until by 7:50 P. M. they were all gone. I did not see any birds fly into the burrows after 7:30 P. M. though several flew out to join those leaving the bluff. Apparently after the young birds are fairly well grown and no longer require brooding the parents leave them for the night, joining other adult birds from their own and other colonies in the vicinity to roost together in the marshes.

At 8:00 P. M., all the adult swallows having gone to their roosting place and darkness about to fall, we closed the observation pit and ended our work for the day.

No observations were made at the nest on the next day, July 7, and when I went to the observation pit on July 8 there was only one young bird in the nest. It was fifteen days old, fully feathered, and practically all the natal down was gone. It walked easily about the nest cavity and burrow, and exercised its wings frequently. The fate of the other nestling I do not know. It may have fallen from the burrow entrance, although I did not find its body at the foot of the bank, or it may have been tempted to try its wings too early.

On July 10, when the young bird was seventeen days old, I spent from 8:35 A. M. to 10:05 A. M. in the pit. During this period it was fed seven times. Several times it ran out to the entrance to call to its parents but usually backed into the burrow when one of them brought food. I worked with the glass window out on this day and once it fell through the opening into the observation pit. It apparently was not excited by this but lay still where it fell until I picked it up, and then sat for several minutes on my hand at the edge of the nest cavity. The old birds were no longer removing excrement and the nest was becoming rather unclean.

When I went to the observation pit on the morning of July 11, eighteen days after the young had hatched, I found the last nestling gone and the nest deserted.

From the data secured in the daily observations at the nest can be made certain general statements concerning the nest life of the Bank Swallow. When the young are first hatched, and for four or five days thereafter, they are brooded almost continuously, apparently by the

female, while the other parent, apparently the male, forages for food. When the male comes with food the female often flies out for a brief time, usually returning by the time he is through feeding the young. If she has not come back by that time he remains to brood them until she arrives. Occasionally she brings food with her.

The food the first few days consists of small soft-bodied insects. In the nest under observation it was mostly of small Diptera. Feeding occurs quite often, averaging twice every five minutes in this nest of three young. Only one young is fed at a visit—that is, all the food brought by the parent on one trip is given to one young. When entering the burrow with food the parent calls in a series of sweet high-pitched notes to the young. If the young are not hungry the parent calls more insistently, at the same time trampling them gently to arouse them.

As the young get older they are brooded less and less, by the sixth day scarcely at all. When brooding is no longer necessary both birds seem to share about equally in the feeding. Many times they both return at the same time with food.

In the nest under observation the food during the middle and latter part of the time spent in the nest seemed to consist almost entirely of may-flies, which were very abundant along the shore of the lake at this time. From the studies of other investigators, notably those of Dayton Stoner on the Bank Swallows of the Oneida Lake region in New York, we know that the food of nestlings includes a variety of other kinds of insects, especially high in those of the orders Diptera, Coleoptera, and Homoptera.

During the first five or six days the small packets of excrement voided by the nestlings are swallowed by the old birds, but throughout the remainder of the time the packets, larger now, are carried outside. During the last two or three days they are not removed at all and the nests soon become quite filthy. This was true of the nest observed from the pit as well as of many others observed from the outside.

Early in life the young birds begin to call, in very weak notes at first. As they become older they call more loudly and gradually their notes come to resermble the characteristic reedy twitter of the adults of the species.

As the young get older they become increasingly active, moving about the nest and nest cavity and later out into the burrow, exercising legs and wings. During the latter part of the time spent in the nest they preen and pick at their feathers a good deal. Young birds are occasionally lost by their moving too far out of the burrow and

dropping to the foot of the bank below. One was thus lost from the nest under observation. Search at the foot of a bank occupied by these swallows during the latter part of the nesting season shows that a number are killed in this way.

Bank Swallows leave their young alone in the burrows at night after they are partly grown, the adults flying away to roost with others of their kind in a marsh.

The old birds keep bringing new feathers and straws or grass stems to add to the nest until a few days before the young leave.

Young Bank Swallows usually remain in the nest until the eighteenth day after hatching, sometimes two or three days longer. By the fourteenth day they are completely feathered with some of the natal down still clinging to them, but this is gone by the sixteenth day. They can fly by the sixteenth day, though not for more than a few minutes at a time. One that escaped from us at this age flew far out over a field but lacked endurance and gradually lost altitude until it came to earth. But by the eighteenth day they can fly quite strongly.

Many times we witnessed what apparently was the initial flight of a young bird. Swiftly it would dart from the burrow and course out over the lake. The old birds flying about seemed to know that this was the first flight of a fledgling for quickly one or two of them would fly close to the young one and follow it. These first flights were noticeably more erratic than those of the older birds. One young bird that took to the air a little too soon could not maintain itself in flight but gradually came down until it fell into the rough waters of the lake. I was unable to learn the fate of this one; it was probably drowned or beaten to death by the waves. But when a young Bank Swallow falls into still or fairly still water it swims easily to land.

Before they are fully fledged young Bank Swallows are entirely without fear, but about the fourteenth day the fear instinct begins to appear. Fledged birds will crouch as far back in the nest cavity as possible when one reaches into a burrow, or, seeing a shadow darken the entrance, they will sometimes fly out, sometimes on unsteady wings. After capture, however, they will submit to considerable handling if it is done carefully, even posing quietly on a stick for a photograph. When returned to the entrance of the burrow they run eagerly back into its dark interior.

According to many writers some of the birds in a colony of Bank Swallows rear a second brood. Dayton Stoner, who has done some very careful work with Bank Swallows in connection with bird banding

operations in Iowa,[1] and later in the Oneida Lake region of New York,[2] believes that the rearing of two broods in a season is a fairly common occurrence. He found newly hatched young in northwestern Iowa as late as August 5, and this certainly looks as though a second brood were being reared. In my own experience, however, I found no evidence of second broods though I looked persistently for them throughout July and August in the Sodus Bay region. Here many young birds were on the wing by late June and by that time flocking had begun, great numbers of both old and young birds being seen every day resting on telephone wires and power lines. Throughout early July the size of these flocks kept increasing while the number of birds flying about the nesting sites and in and out the burrows kept decreasing. We continued watching the birds at the banks and investigating burrows into which we had seen them fly, but in no case did we find eggs or even unfledged young. On July 26, when the banks were pretty well deserted, we investigated a burrow that was still being used, thinking that here perhaps a second brood was being reared, but it contained fully fledged young birds almost ready to fly.

It is true that Bank Swallows are rather irregular as to nesting dates, some beginning egg-laying even after others have well grown young in the nests. Among the swallows nesting in the bluffs on Lake Ontario near Sodus Bay we did not find any great irregularity, for here the birds were not disturbed, and nearly all the pairs of a colony had finished nesting by July 15. But where Bank Swallows are being more or less continually disturbed by the commercial working of the sand and gravel banks, or by the slumping of the banks due to erosion, it is easy to see that there would be more irregularity in nesting. Possibly some unfortunate pairs would have their nests destroyed repeatedly and not succeed in beginning incubation or producting newly-hatched young until late July or early August, and thus give the impression that a second brood was being reared. It is possible, of course, that an occasional second brood is reared in the same season, but I believe that such an occurrence is rather rare, at least among the Bank Swallows nesting in the vicinity of Sodus Bay.

Mansfield State Teachers College,
Mansfield, Pa.

[1]The Auk, Vol. 42, pp. 90-93; Vol. 43, pp. 199-209; Vol. 45, pp. 310-320.
[2]Roosevelt Wild Life Bull., Vol. 9, No. 2, pp. 122-233.

EDITORIAL

THE ANNUAL MEETING this year is to be held at the University of Michigan, Ann Arbor, on November 25-26, and will celebrate the Fiftieth Anniversary of the Wilson Ornithological Club. A number of special features in the program are being planned. It promises to be a big meeting. In 1939 the Club will no doubt meet in Columbus, Ohio, with the American Association. There has been some talk of a meeting of the American Association in Kansas City in 1940, in which case the W. O. C. will no doubt follow. If, however, the 1940 A. A. A. S. meeting is held in Philadelphia we will have to find some place in the Middle West—probably in the northern part of our territory. In this case the stage would be properly set for a W. O. C. meeting in the South in 1941—probably in Nashville, Louisville, Memphis, or elsewhere.

THE EDITOR has received some criticism on the change in the cover of the last number of the WILSON BULLETIN. The objection seems to be directed at the omission of the sketch of the Wilson Warbler. A return to the old cover has been requested. The Editor is reluctant to make a change in the midst of a volume, but at the beginning of another volume he would be glad to make any change which seems to meet with general approval. As well as the Editor can figure out, the WILSON BULLETIN has appeared in nine different covers. Four have been figure designs, while the others have used type designs. The first figure design was a sort of salmagundi (1902-1907); the second one used the Wilson Warbler, peeking over the wall (1908-1915); the third used the Wilson Phalarope (1916-1925); the fourth again used the Wilson Warbler in a conventional pose (1926-1937). The Editor is under the impression that none of these designs was adopted by the Club as a fixture—or at all.

Some of the ornithological magazines have been fortunate in having a fairly constant format and cover design from their beginnings; that is, they were full-grown when they were born. Others have had to grow. Perhaps the WILSON BULLETIN has not matured yet. But who knows what it should be at maturity? Any suggestions or comments from members to the Editor will be gratefully received—and will be stewed up together for the Editor's consumption.

MR. ARTHUR CLEVELAND BENT has issued the announcement that he is now ready to receive notes and photographs relating to any of the North American flycatchers, larks, and swallows, for use in the fourteenth volume of the "Life Histories" series. He also reports that the "eleventh volume is now in press and about to appear, the twelfth has gone to the publishers, and the thirteenth is largely written". Thus this great work is progressing.

GENERAL NOTES

Conducted by O. A. Stevens

Fall Records of Golden Plover in Iowa.—On October 9, 1937, the first day of the open season on ducks, I was hunting on a pond five miles east of Salix in Woodbury County. Early in the morning several large flocks of plovers flew over my blind. One of the hunters on the pond shot into one of the flocks and brought down one bird. I took it to Dr. T. C. Stephens of Morningside College, who identified it as a Golden Plover (*Pluvialis dominica*). These birds were reported in flocks of from twenty to two hundred for several days in that vicinity. On October 17, while out with the Sioux City Bird Club, a flock of about forty Golden Plovers were identified by Dr. Stephens and myself. They were feeding on a fall-plowed field three miles east of Remsen in Plymouth County. —Wilfred D. Crabb, *Sioux City, Iowa.*

Duck Hawks Nesting in Western Tennessee.—While several pairs of Duck Hawks (*Falco peregrinus*) are known to breed annually among the rocky crags of eastern Tennessee, there is only one record, so far as known to the writer, of their nesting in the western part of the State. Consequently it was with great surprise that the writer, with Dr. S. C. Kendeigh, noted an adult of this species circling over the tree tops and screaming incessantly in the extensive swamp forests on the west side of Reelfoot Lake, March 27, 1937. Near at hand stood a tall, dead cypress with the crown broken off. The writer, upon pounding the base of this tree, frightened another Duck Hawk from the broken top of the trunk, some sixty feet in height. Both adults now flew about overhead, screaming continually, one daring to re-alight on the cypress. These actions left no doubt in the writer's mind that they were nesting in the top of the tree stub.—Frank Bellrose Jr., *Brussels, Ill.*

Canada Geese Nesting in Indiana.—My observation of wild geese has always been of the V-shaped flock making its semi-annual pilgrimage to the far north in the spring, or to the south in the fall. Occasionally I have seen them feeding along the Kankakee River or on the small lakes in northern Indiana. Imagine my surprise when I found Canada Geese nesting in Porter County, northwestern Indiana, about eight miles north of Hebron, and not twenty rods from State Highway No. 2 (a concrete road), and not more than 400 feet from a dwelling house. I investigated all places where domesticated geese were kept, and was informed by all owners that none of their birds were missing. Returning to the nesting place I found one gander and three females. The nest was made in the marsh grass at the edge of a pond (not a lake), and contained six eggs. When I approached they rose and flew in a circle, and returned to the nest when I departed.—Charles H. Reider, *Valparaiso, Ind.*

A New Device for Studying Chimney Swifts.—During the summer of 1937 Mr. John Kee, a farmer living in Roane County, West Virginia, showed me a device for studying and photographing Chimney Swifts (*Chaetura pelagica*) which was new to me, and which may be of some interest to ornithologists in general. Mr. Kee had become convinced that it was desirable to have these birds about his home, and, to encourage them, he had taken tin coffee cans, open at the top, had fastened wires on either side of the cans near the top rim, and had suspended

the cans from the chimney, fastening the wires to nails driven in the mortar. In this way the cans could be raised to the top of the chimney, and study and photography were easy. Eighteen had been placed at varying levels in this one chimney, and all were occupied. In view of the difficulties sometimes experienced in reaching and photographing occupied nests of Chimney Swifts, I believe that a wide use of this method might be made by interested persons.—MAURICE BROOKS, *West Virginia University, Morgantown, W. Va.*

A Fatal Combat Between Heron and Snake.—That war is a loss to all concerned is sometimes as true of Nature's less highly developed progeny as it is of mankind. On September 10, at the mouth of North Landing River, Currituck Sound, North Carolina, Dr. W. S. Bourn observed mute but clear evidence of a fight to the death between an unusually large Great Blue Heron (*Ardea herodias*) and a huge (forty-five inch) water snake (*Natrix* sp.). The bird and snake were found sometime after their death very much entangled with each other. The lower mandible of the heron was found to have first penetrated the skin of the snake on the ventral side approximately four inches from the mouth and then to have been forced forward and upward until the tip of the bill finally emerged through the top of the snake's head. Dr. Bourn reports that apparently while this was taking place, "the snake in its struggle to escape, made a complete half-hitch around the bird's neck and a coil entirely around the right wing. This action resulted in so kinking the bird's neck as to break it and at the same time forced the bird's bill through the head of the snake". The observer further reported that "from the evidence presented by the disturbance of the normally firmly packed sand along the beach the action was vigorous while it lasted".—CLARENCE COTTAM, *U. S. Biological Survey, Washington, D. C.*

The Invasion of Northern Mississippi by the Starlings.—Almost fifty years have passed since the Starling (*Sturnus vulgaris*) was introduced into New York City from Europe. It is now fairly abundant in all the southern states, but it is only recently that large flocks have appeared in northern Mississippi. The first record of this bird in Louisiana was in December, 1921 (Walter C. Carey in *Bird-Lore*, XXIV, 95, 122). The first record in Alabama was of one which was blown against a barn during a rainstorm on January 14, 1918 (P. A. Brannon in the *Auk*, XXXV, 224, 1918).

The writer's first contact with the Starling came in December, 1930, when a small flock was observed feeding in a field in company with Cowbirds (*Molothrus ater*), near Tupelo, Mississippi. In January, 1934, a flock of nearly one hundred were seen and photographed near Brooksville, Mississippi. Several blackbirds were in this flock. It may be noted here that Starlings almost always appear to mix freely with members of the family Icteridae. The writer has never observed a flock composed only of Starlings.

The first great flocks appeared near State College, Mississippi, in November, 1934. One of these extended over a distance of a quarter of a mile and was estimated to contain more than 5,000 birds. On many successive evenings several of these flocks were observed moving in directions which converged in an area several miles southwest of State College. During the day the flocks foraged over the countryside, but always appeared to retire to this area in the evening. By the process of triangulation the writer was able to locate this area one evening. He arrived at dusk and found the birds arriving in thousands so that the branches

of the pines in which they were roosting were thickly crowded with them. The ground beneath the trees was white with droppings, indicating that this site had been in use for some time. Probably about ten per cent of these birds were Bronzed Grackles.

Nesting pairs were first noted in the vicinity of State College in the spring of 1935. In May, many of them nested in buildings on the campus, and one pair nested in a hole in a telephone pole previously used by woodpeckers. This nest contained four young on May 15. The birds have bred on the campus in increasing numbers since that time. For some reason many Starlings are found dead, and since the species is new to this locality, people bring many of them to the college for identification.—Ross E. Hutchins, *State College, Miss.*

Piping Plover Taken in Central Ohio.—On September 16, 1937, the writer collected an adult female Piping Plover (*Charadrius melodus*) on a mud flat at the east end of Cranberry Island, Buckeye Lake, Licking County, Ohio. It was first observed at the same place on September 15 by Gene Rea and Dale Jenkins, of Columbus. The specimen was donated to the Ohio State Museum (No. 7503).

The Piping Plover breeds locally on many sandy beaches of the Great Lakes, including those of six Ohio counties bordering Lake Erie (Hicks, *Breeding Birds of Ohio*, 1935). The Ohio breeding population from 1925 to 1935 ranged from eight to twenty-six pairs each year. A careful check of all former nesting areas indicated that only six pairs nested in 1937: three in Lucas County, two in Lake County, and one in Ashtabula County. The decrease is explained in part by man's increased recreational use of Lake Erie beaches in summer. Other dune areas have been destroyed by wave erosion or have been made unattractive by vegetation successions.

The rarity of this plover in inland Ohio indicates that few birds nesting on the Great Lakes cross the State, or, that most of those that cross do not stop. This may be due to the prevalence in the interior of the State of shore-bird feeding areas of the "mud-flat" rather than of the "sand-flat" type. A check indicates that the above record is the second collection for inland Ohio (the first since 1879) and that only about five sight records have been made. The gradual decrease in the number of plovers breeding on the shores of Lake Erie decreases the probability of inland occurrence.

No Ohio records (other than for the Lake Erie Counties) were cited in the State lists of Kirtland, Wheaton, Jones, and Dawson. Wheaton, however, listed the plover as a "not common migrant in the interior of the State", and Dawson considered it "rare or casual in the interior". The only other known inland specimen is a female taken by Charles Dury in Hamilton County, Ohio, on May 4, 1879 (Cincinnati Museum of Natural History Collection No. 114). I find the following five sight records: Englewood Dam, Montgomery County, Ohio, one on August 16, 1924, by Ben J. Blincoe (Wilson Bulletin, XLI, 31, 1929); Cranberry Island, Buckeye Lake, Licking County, Ohio, one on September 20, 1929, by Robert B. Geist and Charles F. Walker; O'Shaughnessy Reservoir, Delaware County, Ohio, one on August 17, 1930, by Lawrence E. Hicks, one on September 7, 1932, by Milton B. Trautman, and one on August 24, 1936, by Gene Rea.—Lawrence E. Hicks, *Ohio State University, Columbus, Ohio.*

Association of Marsh Hawk and Game-bird Nests.—During the past few years much has been written in support of our diurnal birds of prey, the hawks, but little has been done for them especially in the Northern Great Plains States where certain species of hawks are protected legally, but their status is ignored and enforcement is conspicuous by its absence.

In recent years certain state game departments and many so-called "sportsmen's" organizations have gone on record in their local weekly and daily newspapers recommending that hunters shoot hawks they chance to meet while afield. These recommendations have too often been blanket condemnations with no restrictions on any species. Maybe the recommendations were made with the knowledge that the average sportsman can't identify our common hawks in the hand let alone on the wing.

Not so long ago I heard a man, holding an administrative position in a state game department, make this statement to a group of representative sportsmen from every section of the state: "I have always been a firm believer in the beneficial food habits of the Marsh Hawk until this morning, when I found one feeding on a duck. From now on the Marsh Hawk is on my black list". That statement made by a man in an official position, coming as it did just prior to the hunting season, probably did more harm than the hawk supporters in his state can live down in the next five years. That official, like the layman who ventures in any scientific field, arrived at a snap conclusion about as logically as the man who condemned a rat for killing a horse upon which he found it feeding.

Last summer I made an interesting observation on the nesting of a Marsh Hawk (*Circus hudsonius*) and Greater Prairie Chicken (*Tympanuchus cupido americanus*). For some time I had been visiting weekly a sweet clover field in which four young Marsh Hawks were rapidly approaching the time when I could band them and feel reasonably assured that they would take to wing before some prowling marauder destroyed them. Each time I visited the nest the car was driven through the waist-high sweet clover to a lath set about fifty feet away. One day early in July as I visited the nest to band the young Marsh Hawks, I diverted from my usual path about ten feet and to my surprise flushed a Prairie Chicken from a nest containing ten eggs, a few of which were pipped. This was only fifty feet from the nest of young hawks!

Unfortunately I left on my vacation the following day and was unable to continue observations. Upon returning two weeks later I visited the location again and found only eggs from which the young grouse had emerged normally and an abandoned hawk's nest. This was mute evidence to the fact that a grouse and hawk had successfully reared broods of young within, we might say, calling distance. To those who are hasty in passing judgment upon the Marsh Hawk, I hope the above observations will not be termed "coincidental".

One of my associates, Mr. Irvine Dietrich, has kindly permitted me to add a similar incident observed by him near Mandan, North Dakota, a few years ago. A Ring-necked Pheasant was flushed and ran into one of the small patches of Wolfberry bushes (*Symphoricarpos occidentalis*) which are so common on the prairie in this region. At once the pheasant came out again post haste with a female Marsh Hawk in hot pursuit. The hawk overtook the pheasant, struck it and knocked it rolling on the ground. The hawk then returned to the bushes where its nest was located and the pheasant went its way.—Adrian C. Fox, *Park River, North Dakota.*

Nesting of Red-winged Blackbirds.—Observations were made of the nesting of Red-winged Blackbirds (*Agelaius phoeniceus*) in a swamp near Harrisburg, Pennsylvania, during the spring of 1937. The swamp, in a public park, was subjected to damage by fishermen who may have destroyed some of the nests. The swamp, two acres in extent, was mostly of bur-reeds (*Sparganium androcladum*) with ten clumps of cattails (*Typha latifolia*). Although I had seen a female redwing in this swamp on January 1 and 7, 1936, the first migrant in 1937 was seen here March 12, with a flock of males March 25, the females not arriving until April 22. The first trip into the swamp, May 12, revealed three nests, one with eggs.

The nests, when discovered, were given numbered tags and marked with rayon streamers, rayon not getting as heavy as cotton when wet. Five of the nests could not be found the second time, and during the nine weeks and sixteen trips of the investigation the reeds grew from a height of two or three feet to five feet for the bur-reeds and to seven feet for the cattails. Within the swamp also nested Virginia Rail, a Bittern, and Song Sparrows. Owing to the constant movements of the redwings it was not possible to make an exact count of the adults, but there appeared to be over ten pairs and the charted records show sixteen occupied nests on June 1.

All nests were made of the same material, cattail leaves wound around stalks and leaves of reed and lined with grasses, except for a few which contained green algae from the pond and a little mud. No nests were built in any available bush or tree. All but one were built over water and from one to three feet above the surface. One nest which was dissected had been built into eighteen bur-reed stalks, was composed of 142 strips of cattail leaves up to thirty-four inches long, and 705 pieces of grass. The cattail leaves made 273 laps around the reeds, with only one making a complete circuit. The tensile strength of this matting was shown by the fact that the nest could withstand a weight of four pounds before beginning to slide down the stalks. The size of the nests was very uniform; the dissected nest had an inside depth of two inches, inside diameter of three and one-half inches, outside depth and diameter of about four and one-half inches.

Forty-two completed nests were found, but eleven of them were never used although seen repeatedly. No nest was used for a second brood, and no nest would survive the season. The abandonment of the nests resulted from different causes. Some were not used after the birds were frightened away, others were. Redwings will not abandon eggs because of being discovered, as will Robins. The only natural enemies discovered in the swamp were three large water snakes (*Natrix sipedon*). One nest which had contained eggs was later found to be pulled over, as by a snake. No nest contained any Cowbird's eggs; no Cowbirds were seen in the neighborhood.

Twenty-nine nests contained ninety-four eggs among which were two infertile eggs. There were two completed clutches of two eggs, eleven of three, and fourteen of four eggs. One nest with a single egg was abandoned early. Most eggs were of the usual pale blue or bluish-green with erratic brown or black lines, but one set had a pure white background and one clutch of four bluish eggs had no

dots or lines whatever, but over the larger end had sepia washings of varying shades and tones as though painted on with a brush. Freshly laid eggs were found from May 12 to July 12, suggesting two broods for this locality. Sixteen of the thirty-seven nests which were followed through had successful broods, a nest efficiency of forty-two per cent. Including all nests which were built, only one-third produced full grown young which left the nests. Twenty-three nests contained seventy-three eggs of which fifty-three (seventy-two per cent) hatched; the balance had been infertile, deserted, or destroyed. Only thirty-five full grown young birds left the nests, a productivity of forty-eight per cent.

In an adjoining swamp Merrill Wood made a previous study of redwings, reporting in *Bird-Lore* (July-Aug. 1928, p. 262). Twelve nests contained thirty-nine eggs, with two infertile, producing thirty-three nestlings and twenty-one fledglings, a productivity of fifty-two per cent. The incubation period was definitely determined, eleven days in three cases and twelve days in one instance; the young birds left the nest in from eight to eleven days. These young were banded but never heard from again.

The incubation period was not determined by me. Incubation by the Red-winged Blackbird evidently begins before the entire clutch is laid, as all birds are not hatched on or near the same day. Laying with the redwing is probably not a momentary operation, as with some birds such as swallows, but requires several hours upon the nest during which time the eggs laid previously are subjected to incubation. Eleven days seemed the approximate time spent by my young birds in the nest. Twenty-three were banded. The young redwings have a few small sparse tracts of black natal down, located as parietal, occipital, ulnar, scapular, lumbar, sacral, and femoral, with an oblique abdominal.

The ability of a nestling redwing to take care of himself was tested. A nestling less than two or three days old would be apt to drawn if it should tumble out of the nest. As they grow older they become more able to save themselves. Placed in water, the half-grown nestling will float and can swim, but in a very excited manner. They will swim to the reeds and hold on, calling for their parents. When well covered with feathers, but yet a few days before being ready to vacate the nest, they readily swim, but excitedly, and can climb up the cattails to the nest. They are not combative and can not protect themselves against enemies. None of these young had any ectoparasites. An attempt was made to determine their stomach contents by aspiration with an eye dropper, but only liquids and digested material were obtained. By dissection, one stomach was found to contain flies and other insects, no seeds. All of the birds left the swamp on their southern migration early in August.—Harold B. Wood, M. D., *Harrisburg, Pa.*

Blue Goose in Western New York.—On November 11, 1937, I discovered a lone Blue Goose (*Chen caerulescens*) in immature plumage on a small pond which is cut off from Lake Keuka by a willow-grown sandbar. I notified Mr. Verdi Burtch, who made the bird's presence known to a number of Yates County bird lovers and it was visited by several observers in the next couple of days. It remained on this pond for five days and was last seen on November 15. Eaton ("Birds of New York", 1910) mentions the Blue Goose as "one of the rarest waterfowl which visit the waters of New York State". He gives data on but six collected specimens known to that date.—Chas. J. Spiker, *Branchport, N. Y.*

An Albinistic Townsend's Solitaire.—On November 2, 1937, an albinistic Townsend's Solitaire was taken in a banding trap at the Indian Wells Ranger Station, Lava Beds National Monument, Siskiyou County, California. The bird could not be skinned at the time, and was, therefore, banded (36-69698) and released. No color standards were available, so the following description is entirely subjective.

In general, the bird was a dirty white, darkest on the tail, the pigments appearing to be greatly but varyingly diluted, rather than anywhere absent. Beak pinkish gray; legs pinkish light brown, soles of feet yellowish; iris light chocolate, (normal, or only very slightly lighter); head brownish cream, ear coverts

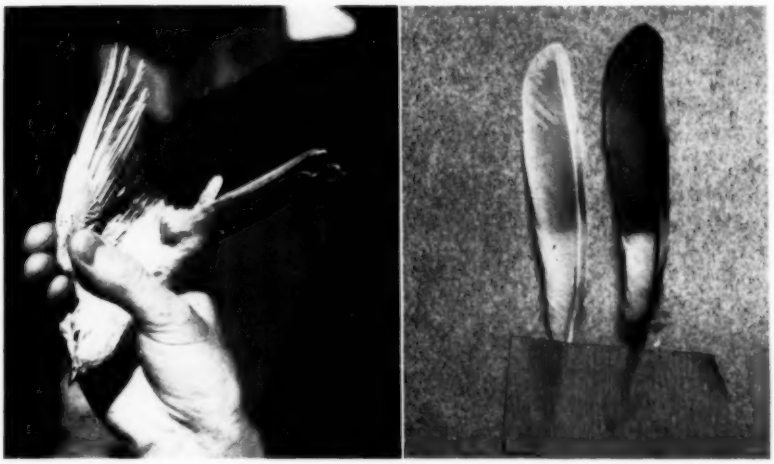

FIG. 22. Albinistic Townsend's Solitaire. The two feathers are the eighth primary of the albinistic bird (left), and the corresponding primary of a normal Solitaire (right).

and feathers below them slightly darker; underparts, back, scapulars, wing and tail coverts dirty white (extremely dilute brown); secondaries and five or six inner primaries dusky white, distal half darker than proximal; buffy wing bars about normal in color; outer primaries as light throughout as proximal part of inner primaries; tail (darkest part of bird) light dirty brown, except for normal distribution of white, and except for the left central rectrix, which was as light as the body and of less than normal length; downy parts of body feathers medium gray with slight buffy cast; quills of all large feathers practically pure white throughout.

This bird (except for the one tail feather) seems to fall within the first type of albinism defined by H. and J. R. Michener (*Condor*, 38(3): 102-109, bottom of p. 108).—RICHARD M. BOND, *U. S. National Park Service, Portland, Ore.*

The 1937 Fall Migration at the Washington Monument.—The following notes may be added to the records of bird migration at the Washington Monument in Washington, D. C. (Wilson Bulletin, Vol. XLVIII, 1936, p. 222; Vol. XLIX, 1937, p. 118). The bird mortality at the monument was much greater in 1937 than in any other recent year, 945 individuals of 43 species having been recorded this fall.

In 1937, again, there were two "big nights", though they were not consecutive as in 1936. On September 12, in the hour and a half preceding midnight, 576 birds fell to the base of the Monument. Two weeks later, on September 26, 251 birds were picked up. The remaining 118 birds struck the Monument in numbers from 1 to 23 on 27 other nights from August 27 to October 30.

The list of birds which struck the monument in the Fall of 1937 follows: Northern Flicker, 1; Brown Creeper, 1; Eastern House Wren, 1; Long-billed Marsh Wren, 4; Short-billed Marsh Wren, 2; Catbird, 1; Olive-backed Thrush, 1; Eastern Golden-crowned Kinglet, 14; Eastern Ruby-crowned Kinglet, 17; Cedar Waxwing, 2; White-eyed Vireo, 31; Yellow-throated Vireo, 1; Blue-headed Vireo, 6; Red-eyed Vireo, 242; Philadelphia Vireo, 2; Black and White Warbler, 13; Blue-winged Warbler, 1; Tennessee Warbler, 7; Nashville Warbler, 1; Parula Warbler (subsp.?), 41; Magnolia Warbler, 121; Cape May Warbler, 3; Black-throated Blue Warbler, 11; Myrtle Warbler, 3; Black-throated Green Warbler, 66; Blackburnian Warbler, 6; Chestnut-sided Warbler, 15; Bay-breasted Warbler, 7; Black-poll Warbler, 7; Northern Pine Warbler, 2; Palm Warbler (subsp.?), 5; Oven-bird, 16; Connecticut Warbler, 7; Yellow-throat (subsp.?), 238; Yellow-breasted Chat, 4; American Redstart, 29; Scarlet Tanager, 1; Indigo Bunting, 4; Eastern Grasshopper Sparrow, 1; Eastern Henslow's Sparrow, 1; Slate-colored Junco, 1; Eastern Field Sparrow, 6; Swamp Sparrow, 2.

As in the preceding two years, the same three species suffered most heavily. There were picked up 242 Red-eyed Vireos, 238 Yellow-throats, and 121 Magnolia Warblers. Nearly two-thirds of the total number were of these three species. There were 66 Black-throated Green Warblers in 1937 as compared with 13 in 1936 and 15 in 1935.

The total number of birds which have struck the Monument in the past three fall migrations is now 1,468, and, with the addition of eight previously unrecorded species, the 1937 list brings the total number of species to forty-seven. The last date Whip-poor-wills were seen flying about the Monument was October 27.

Again Miss Phoebe Knappen and Allen McIntosh of the Department of Agriculture, and William Wimsatt and James Fox greatly aided me in securing the data submitted herewith.—Robert Overing, *Landover, Maryland.*

ORNITHOLOGICAL LITERATURE

BIRD STUDIES AT OLD CAPE MAY. AN ORNITHOLOGY OF COASTAL NEW JERSEY. By Witmer Stone. Two volumes, Royal Octavo. Pp. i-xiv + 1-941. Pls. 1-120, and 270 text figures. Pub. by the Delaware Valley Ornithological Club, Philadelphia (19th St. and the Parkway). 1937. Price, $6.50 postpaid.

A very adequate review of this work comes in a letter from the author himself, who refers to these handsome volumes as a "'field study' covering my experiences in 'days off' since 1890 and those of my fellow members. The 'studies' of behavior and life history are mainly from observations at Cape May but the records cover the whole New Jersey coast. I have tried to picture the environment of the various species and to get the atmosphere and the spirit of the Cape as I know it. (But have not been led into *verse*!!)"

Here we give the reader the story and the background, even including a facetious reference to current BULLETIN editorial. Dr. Stone tells us that "It has been a great pleasure to personally plan and manage the production of such a work and to see it take form just as I had planned."

Probably during the greater part of the half century (forty-eight years) of his studies in this region he was playing with visions of such a work. Can one visualize all this in terms of human life! It becomes the more interesting when we recall the short period of time which Alexander Wilson had for the execution of his ornithological work. What can be more inspiring to the scientific tyro than such a life-long devotion to a purpose, and what can be more satisfying than its final materialization! Dr. Thos. S. Roberts with his "Birds of Minnesota" gives us a very similar picture in the field of contemporaneous ornithology. Both men are Nestors in present-day North American ornithology.

The first seventy pages are devoted to an "introduction", which describes the geography and ecology of the region, the changes in bird life which the author has noted, the migration phenomena, and the monthly calendar. The remaining pages of the two volumes are devoted to the author's annotations of the species treated. The two volumes are bountifully illustrated, there being three colored plates, more than a hundred plates of halftone photographs, and innumerable line sketches. And all of these illustrations have been contributed by Dr. Stone's colleagues in the Delaware Valley Ornithological Club. Thus we record another stately addition to the literature of American ornithology.—T. C. S.

THE BIRDS OF AMERICA. By John James Audubon. With an Introduction and Descriptive Text by William Vogt. The Macmillan Co., New York. 1937. 500 col. pls. Price, $12.50.

Some years ago one of the large Chicago newspapers reproduced in color for its Sunday edition a great many of the Audubon plates. Many people attempted to preserve a complete set of these newspaper reproductions—a futile effort, probably, for most of those who attempted it. Now the complete set of bird portraits has been issued in book form by one of the large publishing houses of the country. There can be no doubt of the beauty of these plates, nor of the privilege of possessing them in one cover. Yet, beautiful as they are, they only enhance the esteem for the work of our modern bird artists. It ought to be possible to award a full measure of praise and credit to this great pioneer artist without indulging in futile hero worship.

As one turns the pages of plates it is comparatively easy to note glaring faults in the coloring. It is not possible, however, to assign the fault. Was it in the original painting, or was it in the hand coloring of the original reproductions? Or is it in the present printed reproduction? We have never had the opportunity of placing two of the elephant folio plates side by side for comparison. But it seems reasonable to suppose that they must have varied to some extent in the color shades. Recently in Indianapolis we did have the opportunity of comparing the first fifteen printed plates (1937) with the elephant folio in the possession of the William Henry Smith Library in the State Historical Library Building. Plate No. 1 of the Wild Turkey (1937) is too yellow on the upper back, too bright on the tip of the tail, the primaries are too light, the leg feathers are too yellow; the iris lacks in color, and the blue bars on the lower back are not as bright as in the original; the details of feathering on the wattle are obscured. Of the fifteen plates compared four were considered to be copied closely enough, while the others deviated in greater or less degree. There is the possibility of variation in the plates of the original elephant folio edition, that is, difference between the plates of the set now in Indianapolis and those used for copying. There is also the possibility that the Indianapolis plates may have become faded or soiled. Or the printer may have erred in selecting his shades of ink.

The names of the birds which appear on the 1937 plates are those authorized by the A. O. U. Check-List, while the full legends of the elephant folios are collected in a "Transcript" at the end of the volume. There is also an index of common names. It is also noted that Mr. Vogt, in the Preface, makes a fair enough mention of Alexander Wilson. And, we may be grateful that there is no derogatory reference to Wilson. An article in a May, 1938, magazine refers to Wilson as "the dour Scotch weaver... who... in his blundering way came to know birds that Audubon never saw until much later", and also refers to his "bitter Scotch soul" and his "ill-directed life"—all of which we have failed to gather from his biographies.

It may be truly said that among all the bird books now available there is no other like this one.—T. C. S.

A Monographic Study of the Red Crossbill. By Ludlow Griscom. Proc. Boston Soc. Nat. Hist., Vol. 41, No. 5, pp. 77-210. Boston, 1937.

The goal of taxonomy is perfect classification, but fortunately for the taxonomist there are still categories that defy him. Therein lies the joy of the work, for it tests one's mettle to bring comparative order out of a chaotic family or genus or species. It is easy to share vicariously the satisfaction of a task well done that must have come to Mr. Griscom with the completion of his study of the Red Crossbill.

In all taxonomic studies opinion must still be the ultimate basis of a scientist's conclusions. The individual is fortunate who can eliminate this factor as far as possible from his analysis. Abundant material is a great aid to this end, but far more important is the innate scientific attitude that enables the individual to recognize the significance and limitations of his materials, and to refrain from unsupported assumptions. This monograph is a fine example of all these attainments. In his introductory pages the author makes clear the strangely contradictory and baffling nature of the data accumulated through field observation and presents logical conclusions regarding the erratic migrations of the crossbill subspecies and the overlapping of their ranges. In the following systematic dis-

cussion he lists a truly imposing total of 2447 specimens examined in private and museum collections throughout the United States. The evaluation of this material as to the condition of the birds when taken also seems judicious, an important point when the bearing of the breeding period on the distribution is taken into consideration.

As is always the case, the taxonomist who makes such a study is so much better informed than any of his readers on the technicalities involved that it would be ridiculous to criticize his arrangement without equally detailed research. The integrity of the author's effort must be the hallmark of his results, and here one can not but feel that nothing is lacking. Whatever changes this fine revision may suffer in the future can only be the results of the gradual progress to which all scientific work is subject.

A final sense of approval arises from the author's opening comments on the Old World races of crossbills. What taxonomist worthy of the name has examined material in any group of animals or plants from the vast expanses of Eurasia without a feeling of diffidence! Yet the Old World forms often aid materially in the analysis of allied Nearctic species, hence such conclusions as are presented are reassuring evidence that the author has left no stone unturned in his attempt at thorough and comprehensive study of these interesting birds.

In conclusion, this paper seems an admirable example of the detailed study of abundant material, and the keen comprehension and admirable restraint through which, alone, the difficult problems of taxonomy seem likely to be solved. Perhaps in the distant future we can find absolute criteria for classification. Until that Utopian day may we have many more monographs like the study of the Red Crossbill.—A. W. Lindsey.

Les Oiseaux de France. Volume III. By A. Menegaux. Published by Paul Lechevalier, 12 Rue de Tournon, Paris, VI. About 317 text pp. plus 64 colored plates and some black ones. Price, 60 francs.

The third volume in this series on the birds of France is now available. It treats of the rollers, kingfishers, bee-eaters, hoopoes, goatsuckers, swifts ,swallows, flycatchers, wrens, waxwings, shrikes, thrushes, warblers, and all other passerine birds. About one hundred pages of keys and taxonomic material form Part I, while Part II is the Atlas including the colored plates with descriptive texts. In format this volume conforms to its two predecessors, being 4½x6¼ inches in dimensions, and cloth-bound. Announcements of the earlier volumes of this series appeared in the Wilson Bulletin for June, 1933, and December, 1934. These pocket-size books are admirably adapted for the use of travellers in Europe.—T. C. S.

The Blue-winged Teal, Its Ecology and Management. By Logan J. Bennett. Collegiate Press, Ames, Iowa. 1938. Pp. i-xiv + 1-144. Price, $1.50.

The frontispiece of this book is a very beautiful colored plate of a pair of blue-wings, the male standing erect with outspread wings. Sidney H. Horn is the artist. The text by Dr. Bennett presents an account of the complete life history of this species. The summer studies were made chiefly in north central Iowa, while the winter studies were made in Mexico. The book contains nineteen chapters, with a bibliography and an index. The usual topics concerned in a life history study are treated in these chapters. Considerable attention is given to the ecology of these birds in an agricultural community, such as Iowa.—T. C. S.

Bird Notes from the Journal of a Nature Lover. By William Graham Ross. Edited by Ella Lamson Clark. Privately published. Burlington, Iowa, 1938. Pp. i-xiv + 1-169. Price, $1.00 (Shriner and Johnson, Fairfield, Iowa).

We might say that this book is written by a gentleman of the "old school". And by that we would mean that in the generation preceding ours there were men here and there who were gifted with a deep appreciation of nature, yet whose enjoyment had to be taken alone. There were no bird clubs to bring like-minded folks together. In spite of their isolation they made observations and recorded them. They had few opportunities for publication—perhaps never thought of publication. The present title seems to be the diary of such a man. The preface states that the notes "cover some thirty years, but largely come from the memoranda made between the years 1898 and 1910". It may be doubtful whether this book adds any facts to the science of ornithology, for precise dates are not given. But it is pleasant reading, and is evidently a partial record of an interesting life. Mr. Ross was a lawyer. It is our impression that fewer lawyers than doctors find relaxation in nature. At the end of the book there is an unannotated list of birds for the vicinity of Fairfield, Iowa, a town which, by the way, is one of the active bird study centers of the state.—T. C. S.

A Descriptive Bibliography of West Virginia Ornithology. By Earle Amos Brooks. Privately lithoprinted by the Author (166 Plymouth Road, Newton Highlands, Mass.). 28 pp. Price, $1.00.

A vast amount of valuable bibliographic information is contained in the few pages of this work. It is offered only as a "fairly complete list of all ornithological publications referring to the Birds of West Virginia". The list begins with Alexander Wilson's work in 1831, and runs through to the date of publication, in 1938. This particular effort is well done and is a service to the ornithologists of West Virginia. We are most impressed, however, by the idea that something of a similar nature might, and ought, be done for nearly every state. Such a bibliography as this one might well serve as a model, both in format and mode of reproduction.—T. C. S.

Environmental Responses of Vertebrates in the Great Basin. By Jean M. Linsdale. Rep. from Amer. Mid. Nat., XIX, No. 1, Jan., 1938, pp. 1-206.

This study was carried out in the Toyabe Mountains in the south central part of Nevada. The paper gives a list of 3 amphibians, 13 reptiles, 152 birds, and 47 mammals, with ecological notes on each. The author found, among other things, that flight songs were frequent, and considered this due to the scarcity of high perches.—T. C. S.

Native Bird Song. By A. R. Brand. Price, 75 cents, any Victor dealer.

This is a Victor phonograph record. Our readers are already familiar with the four discs of bird songs previously issued under Mr. Brand's direction. They were issued under the title, "Songs of Wild Birds" and "More Songs of Wild Birds". (See Wilson Bulletin for June, 1934, and for December, 1936). The present Victor disc records on one side the songs of the Hermit Thrush, Wood Thrush, Brown Thrasher, and Whip-poor-will; on the other side are the songs of the Field Sparrow, Phoebe, Black-capped Chickadee, and Loon.—T. C. S.

LOGBOOK OF MINNESOTA BIRD LIFE, 1917-1937. By Thomas S. Roberts, M. D. Univ. Minn. Press, Minneapolis, 1938. Pp. i-xii + 1-355. 23 figs. Price, $3.50.

Dr. Roberts has here gathered together his communications to *Bird-Lore* under the heading, "The Season". The book contains twenty chapters—one chapter for the letters of each year from 1917 to 1937. Since these letters are based quite largely upon reports from Dr. Roberts' correspondents in most parts of the state, it amounts to a history of the important ornithological events in Minnesota during the twenty-year period. In the Preface Dr. Roberts states that he has compiled and published this Logbook "primarily as a mark of appreciation to all those who have by their contributions made possible the compilation of these articles"—an unusual but most thoughtful mode of expression.—T. C. S.

THE HOME-LIFE AND ECONOMIC STATUS OF THE DOUBLE-CRESTED CORMORANT. By Howard L. Mendall. Univ. Maine Studies, 2d series, No. 38. Univ. Maine Press, Orono, 1936. Pp. i-iv + 1-159.

This paper gives a very full account of the reproductory habits of the Double-crested Cormorant, but distribution and migration are discussed by a chapter on each. Considerable attention is given to the matter of food and feeding habits, and the conclusion is reached that, "except in scattered, local instances, it is largely neutral if not actually beneficial in its relationship to man".—T. C. S.

THE BIRDS OF BREWSTER COUNTY, TEXAS. By Josselyn Van Tyne and George Miksch Sutton. Misc. Publ. Mus. Zool., Univ. Mich., No. 37. Ann Arbor, Mich. 1937. Pp. 1-119. Pls. I-V. Col. frontispiece. Price, $1.25.

The field work on which this paper is based began in 1928 and was continued in 1932, 1933, and 1935. The authors credit 239 living forms of birds to Brewster County. Of these, four subspecies are new, five forms are new to the United States, and eleven are new to Texas. Extensive annotations are accorded most of the forms included in the list. The colored plate, drawn by Sutton, portrays the new subspecies known as Fuertes' Red-tailed Hawk.—T. C. S.

THE AUDUBON YEAR BOOK, 1937. Pub. by the Indiana Audubon Society. Vol. XV. Pp. 1-98. Price, $1.00.

Nearly a hundred pages of readable material are presented in this edition of the Indiana Year Book. Dr. L. A. Test offers a discussion of "Color in Feathers". A list of 173 species of birds of Jay County, Indiana, is presented from the notes of the late Hal B. Coffel. Interesting reminiscences of sixty years ago are offered by Elmer R. Waters, under the title, "The Farmers' Attitude Towards Bird Protection". Teachers will find much information in Esther Boal's paper on "Bird Study for Indiana". Dr. Earl Brooks is the Editor.—T. C. S.

PROCEEDINGS OF THE LINNAEAN SOCIETY OF NEW YORK. No. 48 for 1936. Published by the Society at the American Museum of Natural History, New York. Issued in October, 1937. Pp. 1-112. Price, 75 cents.

The first article is on "The Great Wisconsin Passenger Pigeon Nesting of 1871", by A. W. Schorger. This is a vivid account of the vast numbers of wild pigeons which formerly bred in Wisconsin. The author describes the nesting area as being approximately seventy miles long by ten to fifteen miles wide, amounting to 850 square miles. He estimates that no less than 136,000,000 birds nested in that area that year. The birds were enabled to thrive in such numbers

because of the vast abundance of the oak tree with its fruit. Dr. Schorger was able to bring to light a great amount of factual material by a thorough search of the local newspapers of that period. A. L. Rand presents a paper on the life of two young Blue Jays in captivity, including many interesting notes on behavior. Allan D. Cruickshank gives a report on "The Ornithological Year 1935 in the New York City Region".—T. C. S.

CHECK-LIST OF THE BIRDS OF THE NATIONAL PARKS. Compiled by various observers and issued in mimeographed form by the National Park Service, Washington, D. C. December, 1937.

It is expressly stated that the list is tentative. Perhaps many of the Parks have not been studied thoroughly enough to obtain a complete list of the birds present. The lists of the older and larger Parks may doubtless be considered reasonably complete. Separate lists are given for twenty-three national parks. Each species is very briefly annotated. Considerable variation seems to prevail in the extensiveness of the bibliography for different parks, the one for the Yellowstone Park being especially meager, with too little credit being given to the earlier work of M. P. Skinner, and perhaps others. The authorities of the National Park Service propose to issue this work in printed form when it has reached a satisfactory state of completion.—T. C. S.

We are listing below a considerable number of papers and reports concerning which we assume our readers will wish to know, all of which would have been more fully reviewed except for the limitations of space and time.—ED.

THE GREAT WISCONSIN PASSENGER PIGEON NESTING OF 1871. By A. W. Schorger. Repr. Proc. Linn. Soc. N. Y., No. 48, 1936, published October, 1937.

BIRDS OF THE YOSEMITE. By M. E. Beatty and C. A. Harwell. Yosemite Nature Notes, XVII, No. 1, Jan. 1938. Pp. 1-34. Price, 25 cents. Number of species listed is 202.

A STUDY OF THE DISTRIBUTION AND MIGRATION OF THE GREAT HORNED OWLS IN THE MISSOURI VALLEY REGION. By Myron H. Swenk. Repr. with revision of page 100 from Nebr. Bird Rev., V, October, 1937.

NESTING BIRDS OF IOWA. By Thos. G. Scott and George O. Hendrickson. Extension Circ. 247, Iowa State College, Ames. March, 1938. Pp. 1-64. Figures of common birds are to be colored by the pupil .

THE PTERYLOSIS OF THE FALCONIFORMES WITH SPECIAL ATTENTION TO THE TAXONOMIC POSITION OF THE OSPREY. By Lawrence V. Compton. Repr. Univ. Calif. Publ. in Zool., Vol. 42, No. 3, pp. 173-212. Berkeley, Calif., 1938. On the basis of the pterylosis the Osprey is found to be more closely related to the American Vultures (Cathartae) than to the Falcones.

TERRITORY, ANNUAL CYCLE, AND NUMBERS IN A POPULATION OF WREN-TITS (CHAMAEA FASCIATA). By Mary M. Erickson. Repr. Univ. Calif. Publ. in Zool., Vol. 42, No. 5, pp. 247-334. Berkeley, Calif. 1938. A full life history study of this western species.

A Pictorial Guide to the Families of Birds, Including a List of the Birds of Southeastern Michigan with Their Migration Dates. By Edward Boardman and Elizabeth Barto. Bull. No. 9, Cranbrook Inst. Sci., Bloomfield Hills, Mich. Pp. 1-48. 1937. Price, 50 cents. An illustrated key to the families of birds.

Some Early Bird Records of Wisconsin and Neighboring Territory to the West and North (1896-1900 and of Indiana (1876-1877). By M. E. Pinney and J. F. MacNaughton. Repr. Trans. Wis. Acad. Sci. Arts & Letters, Vol. 30. 1937.

The Birds of Boulder County, Colorado. By Gordon Alexander. Repr. Univ. Colo. Studies, Vol. 24, No. 2, March, 1937. A list of 250 species given with brief annotations.

Faunas of Canada. By R. M. Anderson. Repr. from Can. Year Book, 1937. Mainly an elaboration of Merriam's system of life zones.

Mammals and Birds of the Western Arctic District, Northwest Territories, Canada. By R. M. Anderson. Repr. from Canada's Western Northland. 1937. An account of relatively unexplored country, with chief attention to mammals.

Beautiful Birds of the Southern Audubon Sanctuaries. By Alexander Sprunt, Jr. Bull. No. 8, Nat. Ass'n Aud. Soc. New York, 1938. 7½x11¾ in. Pp. 1-39. Price, $1.00. Eleven beautiful colored plates adorn this pamphlet: about seventeen subtropical American birds are popularly described. All of these birds are large and spectacular in appearance. They are the birds which the Audubon Society has concentrated upon especially in protective efforts.

The Migration of North American Birds. By Frederick C. Lincoln. Circ. 363, U. S. Dept. Agric., Washington, D. C. 1935. Price, 10 cents.

The American Egret in the Albany Region. By Dayton Stoner. Bird Day number, Bull. to Schools, Univ. State N. Y. March 15, 1938. Price, 5 cents. Other articles on birds are included.

The Postjuvenal Molt of the Grasshopper Sparrow. By George Miksch Sutton. Oc. Papers Mus. Zool., Univ. Mich., No. 336. Ann Arbor. 1936. 1 col. pl.

The Juvenal Plumage and Postjuvenal Molt of the Chipping Sparrow. By George Miksch Sutton. Oc. Papers Mus. Zool., Univ. Mich., No. 355. Ann Arbor, Mich. 1937.

Are They Vermin? Cornell Rural School Leaflet, Vol. 31, No. 2, Nov., 1937. Pp. 1-32. A useful compilation of facts concerning hawks, owls, and mammals commonly classed as "vermin".

Factors Affecting Yearly Abundance of Passerine Birds. By S. Charles Kendeigh and S. Prentiss Baldwin. Repr. Ecol. Monog., Vol. 7, pp. 91-124. 1937.

The Birds and Mammals of the Western Slope of the Azuero Peninsula, Republic of Panama. By John Warren Aldrich and Benjamin Patterson Bole, Jr. Sci. Publ. Cleveland Mus. Nat. Hist., Vol. VII, pp. 1-196. 1937.

Crow-Waterfowl Relationships. By E. R. Kalmbach. Circ. 433, U. S. Dept. Agric. Washington, D. C., 1937. Price, 10 cents.

The Distribution of Breeding Birds in Ontario. By James L. Baillie, Jr. and Paul Harrington. Repr. Trans. Roy. Can. Ist., Vol. XXI, 1936-1937.

A Ten Year Study of a Bird Population in Central Ohio. By Lawrence E. Hicks. Repr. Amer. Midl. Nat., Vol. 16, No. 2, pp. 177-186. Notre Dame, Ind. 1935.

The Birds of the Lake St. Martin Region, Manitoba. By T. M. Shortt and Sam Waller. Contr. Royal Ont. Mus. Zool., No. 10. Pp. 1-51. Pub. under the Reuben Wells Leonard Bequest. 1937.

Baird's Sparrow. By B. W. Courtwright, T. M. Shortt, and R. D. Harris. Contr. Royal Ont. Mus. Zool., No. 11. Pp. 153-199. Repr. Trans. Roy. Can. Ist., XXI, Pt. 2, 1937. This paper gives the latest summary of the known distribution of this species.

Ontario and Its Avifauna. By L. L. Snyder. *And* The Museum's Bird Collection. By J. L. Baillie. Pub. under the Reuben Wells Leonard Bequest. 1938.

The Resident Birds of Southern Michigan. By William Henry Burt. Bull. No. 7, Cranbrook Inst. Sci. Bloomfield Hills, Mich. 1936. Price, 50 cents. Twenty-eight resident species of birds are popularly described by the author and illustrated in black and white by George Miksch Sutton.

Wildlife Management in the National Parks. By George M. Wright and Ben H. Thompson. Fauna series No. 2. Pp. i-viii + 1-142. Washington, D. C. 1935. Price, 20 cents. A little confusing on the title page, but an excellent report, well illustrated.

Thirst on the Land. By William Vogt. Circ. No. 32, Nat. Ass'n Aud. Soc. New York. No date. A pretty full elucidation of the drainage problem.

Small Refuges for Waterfowl. Pub. anonymously by the More Game Birds in America Foundation, 500 Fifth Ave., New York. 1933. Those who would like to have wild ducks even within the city limits should read this pamphlet.

Wildlife Cycles in Relation to the Sun. By Leonard William Wing. Repr. Trans. 21st Amer. Game Conf. 1935.

Behold—The Innocent Blatter! Reprint of editorial by Harry McGuire in Outdoor Life for Feb. 19, 1934. A stirring appeal for the removal of sheep from the National Forest areas. If every conservationist in the country could read this valiant appeal surely something would be done.

Birds of the Eastern Arctic. By P. A. Taverner. Repr. from Canada's Eastern Arctic. 1934.

A Bibliography of Tennessee Ornithology. By Jesse M. Shaver. Repr. Journ. Tenn. Acad. Sci., VI, No. 4, October, 1931. A collection of 237 bibliographic citations on Tennesse ornithology, arranged alphabetically.

A Historical Review of the Habits and Anatomy of the Woodcock. Compiled from the earliest drawings and accounts to those of the present day. By Henry Mousley. Repr. Canadian Field-Nat., XLIX, January, 1938. A valuable source of early information.

Nesting Colonies of the Double-crested Cormorant in British Columbia. By J. A. Munro. Repr. Prov. Mus. B. C. Pp. 26-30. 1936.

The American Merganser in British Columbia and Its Relation to the Fish Population. By J. A. Munro and W. A. Clemens. Bull. No. 55, Biol. Board of Canada. Pp. 1-50. Ottawa, 1937. Price, 35 cents.

Man's Friend: The Crow. Publ. No. 65, Emergency Conservation Com. New York, 1937.

Owls. Teaching Unit No. 5. By Ellsworth D. Lumley. With Introduction by Paul L. Errington. Pub. No. 67, Emergency Conservation Com. New York. 1937.

Review of Local or State Periodicals Printed

The *Nebraska Bird Review* for October (V, No. 4, 1937) presents an exceedingly illuminating article on the distribution and migration of the Great Horned Owls in the Missouri Valley Region, including a discussion of the taxonomy and nomenclature. No one interested in this species in the interior can afford to overlook this paper. The same serial for January-June (VI, No. 1, 1938) appears in a brand new dress, featuring a new figure of the Burrowing Owl by Dr. Sutton. At the same time the magazine becomes a semi-annual instead of a quarterly publication. The new cover makes a decided improvement. This issue contains a short paper on the birds of the Crescent Lake Migratory Bird Refuge (in the sandhills), and more than eighteen pages of "general notes"—quite a remarkable collection of material.

The *Kentucky Warbler* (XIV, No. 1, 1938) now appears in a new cover, with a design by Mr. Ganier. Dr. J. J. Murray, of Virginia, contributes the leading article on some breeding birds of Letcher County, Kentucky, fifty-six species being listed. Short notes and minutes fill the remainder of the 12-page number.

The *Flicker* for December (IX, No. 3-4, 1937) contains a list of 1937 nesting birds in Minnesota, and an account of an ornithologist's trip afoot in Northern Minnesota, both by G. N. Rysgaard. Another article by Dr. C. Evans gives a description of the mating of the American Bittern.

The September number of the *Migrant* (VIII, No. 3, 1937) publishes an article reporting a flight of Mississippi Kites. As many as thirty-four were counted at one time, all feeding on the periodical cicadas in a woodland area. In the number for December (VIII, No. 4) Mr. Arthur Stupka reports Pine Siskins in the Great Smoky Mountains from March to December, 1937. Mr. Ben B. Coffey writes on his work in banding Chimney Swifts, 2,375 being banded in 1937. In the March number (IX, No. 1, 1938) Mr. Frank Belrose contributes a list of birds seen in the Great Smoky Mountain National Park during about a week in early September, 1937. Mr. E. D. Schreiber reports on the results of fifty-three nest boxes erected

during the seasons of 1936 and 1937. Several observations on the destruction of young birds by snakes are included in this paper. Considerable space is given to Christmas census reports.

In *Iowa Bird Life* for December (VII, No. 4, 1937) Dr. L. J. Bennett and Miss Kate E. LaMar present a report of a ground-nesting colony of Black-crowned Night Herons in north central Iowa. Other papers included are, "Conclusions as to the food habits of the Barred Owl", by P. L. Errington and Malcolm McDonald, and "Birds of the Sioux City Area in 1936", by Bruce F. Stiles. The March number (VIII, No. 1, 1938) contains an account of the 1934 spring migration through Clay and Palo Alto Counties, Iowa, by Dr. Logan J. Bennett. The article on the birds of the Sioux City area in 1936, by Bruce F. Stiles, is concluded. A page and a half of general notes, with three pages devoted to the Christmas census completes the number.

Review of Local or State Periodicals Mimeographed

The *Wildlife Review*, No. 11, Feb., 1938, abstracts 104 pieces of current literature on wildlife conservation. A second number (No. 12) was issued in February for the purpose of abstracting the papers presented in the Transactions of the Second North American Wildlife Conference held in November, 1937. No. 13 was issued in March, and No. 14 was issued in May.

In the *Snowy Egret* for Spring, 1938 (XIII, No. 1) Mr. H. A. Olsen gives a history of his publishing efforts. Mr. O. M. Bryens gives an interesting account of his observations on the habits of the Ruffed Grouse. Mr. Byrens also contributes five other papers to this issue. One of the latter includes some notes on the winter movements of the Lapland Longspur, showing that the birds were present throughout the winter of 1936-1937.

The *Prothonotary* for December (1937) and January and February (1938) follow pretty closely the usual plan of reviewing the preceding month's weather conditions and giving noteworthy bird records and miscellaneous notes. The March number (IV, No. 3a, 1938) features a very readable article on conservation, reviewing the situation in a way suitable to the observance of National Wildlife Restoration Week—an occasion which will doubtless recur annually hereafter.

The Editor of the *Redstart* in the December number (V, No. 3, 1937) reports his ornithological observations along the South Carolina coast. Among other things of interest he saw an Arkansas Kingbird. A note in the March number (V, No. 6, 1938) shows the regularity in the fall migration of the Nighthawk—only one day variation in five years. Members of the Brooks Bird Club do not hesitate to travel a hundred miles on a bird study trip, as was shown by their pilgrimage to the Pymatuning Lake area in Pennsylvania, and reported in the May number.

The *Bluebird* for January (V, No. 1, 1938) gives a sight record for two individuals of the Eastern Ground Dove near Columbia, Mo., on September 31 (1937?), and in support mentions that this species has been "taken both in

Arkansas and Iowa (Des Moines)". If this refers to the case reported in the *Auk* (XXXIX, 1922, p. 566) it must be emphasized that no specimen was taken, and DuMont (1934) placed it in the hypothetical list. Accompanying this issue there is "An Introduction to Bird Study in Missouri" by Prof. Rudolf Bennitt, which gives many hints for the pursuit of bird study, especially for the beginner. The April number (V, No. 4) gives a column approval for grasshopper poisoning work. Bird students in general will do well to suspend judgment on this matter for another year or two.

The *St. Louis Bird Club Bulletin* for January (VII, No. 1, 1938) consists of four pages of matter of local and general interest. Among other things the question is raised whether applicants for a hunting license should be required to pass an examination concerning the game laws and show ability to identify game which can be legally killed. It also gives, on authority of the U. S. Biological Survey, estimates of our wild duck populations, as follows: 1,000,000,000 in 1870; 100,000,000 in 1930; 27,000,000 in 1935.

The *Chickadee* for December (VII, No. 1, 1937) features a list of 179 species of birds locally observed.

The September-October number of the *Raven* (VIII, No. 9-10, 1937) contains: "Birds of Chatham, Virginia", by Eleanor E. Herrick, it being a list of 106 species; and "Herons and Egrets on the Potomac River near Alexandria, Va.", by William B. McIlwaine, Jr., besides many brief items. In the November-December number (VIII, No. 11-12) Dr. J. J. Murray discusses "The Extension of the Range of the Black Vulture". He finds that there has been an actual northward extension, and accounts for it by a diminution of the regular food supply in the South. This, in turn, is thought to be due to progress in sanitary practice, such as burial of dead animals and discontinuance of the practice of the markets of throwing the waste meat into the streets. Dr. Murray also gives some very interesting facts relative to changes in the distribution of other species. Dr. Murray's writings are substantial.

The September-October number of the *Chat* (I, No. 7-8, 1937) consists of an extensive article on the birds of Lake Mattamuskeet, N .C., by Earle R. Green. It is accompanied by a map, a plate of two photographs, and a bibliography. The number for November-December (I, No. 9-10, 1937) gives an account of several rather northerly located rookeries of the Little Blue Heron. This seems to be another case of extension of range. There is also a report of a sight record of two American Flamingoes on Pea Island in June, 1937. "Learn a bird a week" is a novel feature in which four common birds are roughly illustrated and accompanied by a list of field marks. The January number (II, No. 1, 1938) summarizes the Club's accomplishments for the preceding year, thus: Six issues of the *Chat*, including 72 pages, 1200 copies mailed to 19 states and Cuba, with other figures on various matters. In the February number (II, No. 2) Dr. T. G. Pearson reports some observations which he thinks may confirm Mr. McAtee's account of certain birds placing live ants (or other insects) in their plumage (see the *Auk* for January, 1938). A very thoughtful discussion of bird conservation philosophy by the State Ornithologist of Massachusetts, Joseph H. Hagar, is also found in this number. The March-April number (II, No. 3-4) records the Proceedings of the Second Annual Meeting of the North Carolina Bird Club,

and reports 32 new members, making a total membership of 133. Mr. C. S. Brimley, well-known zoologist throughout the country, contributes a short biographical sketch. A paper by Mr. T. M. Carter reports three large Robin roosts in North Carolina, with an estimated total population of about six millions of the birds. The account is brief, but indicates an opportunity for an intensive study.

The *Bird Calendar* of the Cleveland Bird Club for June-July-August, 1937, continues on the same plan as before, but gives special attention in this number to census work.

The *Inland Bird Banding News* for December (IX, No. 4, 1937) contains the minutes of the Annual Meeting and reports of the officers. There is also a note on the "Feeding habits of the Black Tern", by Paul W. Hoffman. This paper makes some observations on the food of this species, and on the manner of securing it. It is stated that the Black Terns "rarely plunge into the water for food as do other members of the tern family". It is also found that Forster's Terns occasionally "adopt" the young of the Black Tern. The March number (X, No. 1, 1938) reports some good work in endeavoring to secure support in South American countries in bird banding and protection. Mr. M. J. Magee reports results of his banding work on Purple Finches.

In *News from the Bird Banders* for January (XIII, No. 1, 1938) we find an article entitled "The Herring Gull: An Experiment in Co-operation". This undertaking was carried out in gull colonies along the Atlantic coast, and a total of 6,140 birds were banded in nine colonies from the Gulf of St. Lawrence to New York. All birds received an aluminum band and one or more colored celluloid bands, the combination being the same for each colony but different from the other colonies. Thus, birds may be identified with one of the nine colonies without capture.

North Dakota Bird Notes for 1937 (March to June). Under this heading we have thirteen dated sheets of bird notes on the migration season in that state. These notes were compiled by Prof. O. A. Stevens, at Fargo, and have appeared annually for a long period.

The *Fifth Annual Bulletin* (1937) of the Toledo Naturalists' Club consists of thirty-seven mimeographed pages enclosed in an artistic cover produced by the silk screen process. Among the articles we find instructive accounts of the habits of several species, e. g., the Chimney Swift, by Miss A. A. Vandenburg; the Great Blue Heron, by John J. Stophlet; and on the Bank Swallow, by F. J. Flickinger. Mr. L. W. Campbell reports the unusual bird records for the year 1937. Such a volume affords an excellent method of preserving the Club's activities.

COMMUNICATIONS

Editor, WILSON BULLETIN: The WILSON BULLETIN for March, 1938, has just come to hand, and I have been reading it, as usual, from cover to cover.

On page 61, under the heading, "Whooping Cranes in Southwestern Missouri, 1937", there is described what is purported to be the nesting of a Whooping Crane in that section. Perhaps the editor of the WILSON BULLETIN did not read this article before it was printed; for I can not imagine why it was given space. If the description is accurate, the bird could not possibly be a Whooping Crane.

First, the bird "flew into the very top of a dead tree where I could see her perfectly, silhouetted against a green hill beyond". *Second*, further along in the article, speaking of the young birds, they were "about the size of a good big hen and able to fly". *Third*, the last paragraph of the article ends as follows: "and one can only be thankful that these birds escaped the perennial warfare of state fish hatchery employees against fish-eating birds".

Having had vast experience with the Whooping Crane when they were exceedingly plentiful; having had them in captivity, watched them at their nesting places; and having seen them disappear almost completely from our fauna, I have *never* seen a Whooping Crane light in a tree. The young of the Whooping Crane, when able to fly, are four times as large as any hen, and stand fully five feet in height; and, while Whooping Cranes will occasionally take fish, they are not and never will be fish-eaters.—E. A. MCILHENNY, *Avery Island, La.*

Editor, WILSON BULLETIN: Thank you very much for sending me Mr. McIlhenny's letter. Criticism by a man of his standing and long experience certainly deserves serious consideration and reply.

There are six large, white birds that would be at all likely to occur in Missouri at any time: White Pelican, Snow Goose, American Egret, Whistling Swan, Wood Ibis, and Whooping Crane. Mrs. Cahill's bird had black wing-tips, which eliminates the swan and the egret. It had long legs, which eliminates the swan, the pelican, and the goose. It had a white head, which eliminates the Wood Ibis. Mrs. Cahill sent me a profile sketch of the head, which showed a typical crane bill, not that of an ibis, a pelican, or a heron.

The Whooping Crane is the only one left. Evidence *pro:* Size, color, bill, legs, flight with neck extended, voice. Evidence *con:* Mr. McIlhenny's statement that (1) he has never seen a Whooping Crane alight in a tree, (2) the young when able to fly are five feet high and four times as large as any hen, and (3) these birds are not fish-eaters. Discussing his points in reverse order:

(3) The fact that the birds visited the hatchery is no proof that they were eating fish. However, the "perennial warfare" does exist, and it is waged against all the large waders which are *thought* to eat fish by the hatchery men. This point seems to me irrelevant.

(2) The size of the young birds was reported one morning at dawn by Mrs. Cahill's husband. Light conditions were poor, and if his comparison re-

ferred to the size of the body, rather than the height above ground, the error seems understandable but not destructive to the other evidence.

(1) Does a Whooping Crane ever alight in a tree? I have never found evidence that it does; therefore I wrote Dr. H. C. Oberholser, who has known about this record since last fall. The following paragraph is taken from his letter of May 7:

"Your point regarding the alighting of the bird in a tree is not so clean-cut and distinctive as might seem at first hand, since all birds do strange things under peculiar circumstances, and I should not consider that this point weighed materially against the bird being a Whooping Crane. In the first place, the Whooping Crane is in general a bird of the open country where there are no trees—marshes, plains, prairies, meadows, and similar areas—and I suppose a large part of the actual field observations of cranes of this species have been made in such areas. Therefore it is entirely likely that a person even very familiar with the bird in life may never have seen one alight in a tree; but this, of course, does not prove that the bird never does such a thing. In parts of its winter range, particularly in Texas, this bird lives about ponds in the midst of woodlands or tall chaparral, where there is plenty of cover and protection, as well as on the more open areas, and I have myself seen the bird about ponds in forests of low trees. Under the circumstances it is entirely likely that the bird would occasionally alight in a tree, for it is just as able to do so as is a Great Blue Heron, which is about the same size."

It seems to me that Mr. McIlhenny's undeniably valid criticism is not strong enough to overcome the weight of evidence on the other side, provided the evidence was reported to me truthfully. Knowing Mrs. Cahill and many of her associates at the School of the Ozarks and elsewhere, I know there is no question of this.—Rudolf Bennitt, *University of Missouri, Columbia, Mo.*

This case is now open for discussion.—Ed.